The

Electrical Review

VOL. XCVIII. JUNE 25, 1926. No. 2,535.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY, Price 6d.

Chairman: H. ALABASTER.

Technical Editor: A. H. ALLEN, M.I.E.E. *Joint Managing Directors:* G. H. ALABASTER. E. A. GATEHOUSE, M.I.E.E. A.M.INST.C.E. *Commercial Editor:* A. H. BRIDGE.

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Telegraphic Address: "AGEEKAY, CENT., LONDON." Code, A B C. Telephone No.: Central 7072 (Three Lines).

The "Electrical Review" is the recognised medium of the Electrical Trades, and has by far the Largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d.; Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to THE ELECTRICAL REVIEW, LIMITED, and crossed "Midland Bank, Newgate Street Branch."

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The I.M.E.A. Convention.

THE Convention which was held last week at Glasgow by the Incorporated Municipal Electrical Association, in despite of adverse conditions, must be set down as one of the most successful in the history of the Association; the attendance fell but little short of the high record attained at Brighton last year, in far more favourable circumstances, showing unmistakably that the members fully endorsed the decision of their Executive Council to carry out the programme as far as possible, and the weather, which is so important a factor on such occasions, with the exception of one bad break, was mostly fair and sometimes excellent, being especially gracious during the delightful excursions to the Trossachs and the Falls of Clyde which brought the Convention to a close. The only notable departure from the original programme was the unavoidable abandonment of the river trip, and this proved to be a fortunate chance, for it fell on the one rainy day; instead, a visit was made to the Gleneagles Hotel, where fair weather prevailed, and as the President remarked after dinner, in expressing the thanks of the Association to the Babcock & Wilcox Company, a trip on the river in the rain was a thing to be avoided. Mr. R. B. Mitchell is to be congratulated on his admirable conduct of a most enjoyable Convention, and on the efficiency with which he and his staff collaborated with the honorary secretary, Mr. A. C. Cramb, and the secretary, Miss Lanfear, and her assistants in the work of organisation under unusually difficult conditions.

Mr. R. W. L. Phillips, of Bedford, was elected president for the ensuing year, and will be faced with the problem of housing so large a body of members; doubtless, as Bedford cannot possibly provide adequate accommodation, the Convention will be held elsewhere, and various more or less helpful suggestions have been put forward to solve the problem. It is interesting to note that, following the chief of one of the largest undertakings in the country, the new President represents one of the smaller ones, whilst Mr. F. W. Purse, the new vice-president, who was formerly a champion of the small undertakings and took a prominent part in securing their direct representation on the Council, is now in charge of an undertaking which falls within the "large" category.

Seeing that the membership of the I.M.E.A. now stands at 225 (out of 264 undertakings eligible for membership), the fact that the attendance numbers about 700 indicates that the engineers are in the minority; that so many councillors take part in the Convention is a highly advantageous circumstance, as it enables them to exchange views on electricity supply and to absorb new ideas with regard to progress and enterprise, which must bear fruit in the enlightened management of their own undertakings. The greatest drawback to municipal electricity supply is undoubtedly the necessity of entrusting so highly technical a business to the hands of lay committee-men who, through no fault of their own, come to the work with absolutely no training for it and generally with no prior knowledge of its complexities; the Conventions offer to those who have so far triumphed over their difficulties as to attain the rank of chairman priceless opportunities for improving their knowledge and broadening their outlook. The popularity of these meetings is further exemplified by the large number of ladies who take part in them, and this factor is being turned to good account from the business point of view, by enlisting their services in the work of development with the aid of the Electrical Association for Women, which is rapidly gaining strength and, under the able management of the chairman, Alderman Mrs. Hammer, the secretary, Miss Haslett, and an energetic committee, is destined to play a notable part in hastening the adoption of electricity for every domestic purpose.

The professional work of the Association on this occasion, without being too burdensome, was both varied and interesting; the papers were practical, and the visits instructive. The latter included an up-to-date and highly efficient steam power station, a hydro-electric installation of some importance, and (on Saturday) an example of co-operative enterprise in the shape of the rapidly developing joint undertaking of the Ayrshire Electricity Board, which embodies the principles of interconnection, centralisation of generating plant, extension into rural areas, and the supply of power to a variety of industries from one station—all highly commendable and tending to promote the public welfare. The electrical exhibition which was held in connection with the Convention was also larger, more varied, and better organised than on any previous occasion, reflecting great credit on all who took part in its preparation—amongst whom the first place must, of course, be given to the British Electrical Development Association. Several new devices of considerable promise were shown at this exhibition, and attracted a great deal of attention; we anticipate that the exhibitors will have no ground for complaint with regard to the business side of their participation, whilst the educative effect of the show, which was open to the public during certain hours, must have been very valuable.

It should be borne in mind that the "slogan" of the Lord Provost and the Electricity Committee of Glasgow Corporation is "cheap electricity," and that their practice is in accordance with their precept; electrical energy is supplied for domestic purposes at ¾d. a kWh, plus a small fixed charge, and during the night, for heating water, it is available at ⅜d. per kWh. As Dr. S. Parker Smith has shown, at these rates there is every inducement to use electricity for all domestic purposes, without the aid of coal or gas, the saving in labour not only lightening the burden of housework but actually resulting in economy of wages, in addition to the reduction in cost of maintenance. Wherever such conditions obtain—and we understand that they are already available to four million people in this country—the *all*-electric house is a practical economic proposition.

Finally, turning to the report of the Council, of which we will print an abstract next week, we find that the committees have done very good work in connection with the improvement of electric cookers, with especial attention to the question of standardisation, and with the reform of the regulations for overhead line construction, which we hope will be materially influenced by the recommendations which the Council has submitted to the Electricity Commissioners.

Our Trade Names Supplement.

ACCOMPANYING the present issue of the ELECTRICAL REVIEW, we are circulating, free of charge, to the whole of our readers at Home and overseas—approximating to 13,000—the first of a series of four Quarterly Supplements of Electrical Trade Names. We have had abundant evidence of the need for such a publication in the thousands of inquiries that have reached us during the last few years asking the names of the makers or suppliers of a specified piece of apparatus, article, or material.

Every day we receive communications from correspondents at home and abroad telling of something electrical that they wish to purchase but cannot, because they only know its trade name. Generally, we are able to answer these questions through the post, and business passes on to the manufacturer or trader. We do not begrudge this service—indeed, we like to render it—for in serving non-electrical buyers we are bringing them into direct touch with the electrical trade. But we are convinced that the publication of the information in the form of a special periodical supplement will simplify the operations of our readers and save some of the time that is necessarily lost in sending in inquiries, hunting up our records, and dispatching replies. It is safe to calculate that for every inquiry that reaches us there are many others which are never made, but can easily be satisfied by reference to a printed list. We believe that if this Supplement is in the hands of the whole body of ELECTRICAL REVIEW readers everywhere many questions can be settled at once as they arise. The value of the Supplement will be increased as the entries are added to in successive issues, but it is not intended to supply this directory of trade names apart from the ELECTRICAL REVIEW. Our Service Department will continue its activities in this and other directions, and correspondence is invited from those in need of information not at present obtainable from our list.

Municipal Selling Powers: Agreement at Swindon.

WHEN these lines appear in print the Convention of the Electrical Contractors' and Allied Associations will be in progress at Brighton, and prominently before the minds of all present will be the question of municipal selling powers. Already the subject has received prominence at the gathering of the I.M.E.A. both in the address of the president and in the report of the Council, while other important deliberations have been taking place for some time past. What has happened in connection with several Bills before Parliamentary Committees is familiar to our readers, and we may now direct attention to the Swindon Corporation Bill case, which is reported on another page of this issue. The Corporation sought under one of the clauses of its Bill relief from its existing obligation to carry out the wiring of premises only through a contractor. As a result of negotiations between the I.M.E.A. and the E.C.A. the opposition to its application for this relief was dropped subject to a number of conditions which are set out in our report. These conditions entail a regulation of the prices at which installations and apparatus shall be sold; retail prices to the public and trade prices to contractors. The prices are to be fixed at such figures as shall cover all expenditure, including financial charges, and the accounts for such trading operations are to appear separately in the published returns of the department. The aforesaid retail and trade prices will be determined by a committee representative of the interests concerned, which committee is to be appointed by the Electricity Commissioners.

The Efficiency of Gas Works.

IT is well known that gas engineers claim to obtain an efficiency of 75 or 80 per cent. in the manufacture of gas from coal, and that for this purpose they include the gross heat content of the coke and tar on the credit side of the account, regardless of the fact that the heat thus "recovered" cannot be utilised without a further process of conversion involving heavy loss; in point of fact, the heat in the tar is not usually

employed as heat at all. But there is another way of looking at the matter which does not seem to have received due attention.

In the course of an able paper on "Competition with Electricity," read by Mr. H. E. Copp, of Hull, at a recent meeting of gas managers in Newcastle-on-Tyne, the author states that the gas produced from coal represents 23 per cent. of the original energy, the coke 46 per cent., and the tar 6 per cent.—total, 75 per cent., the loss being therefore 25 per cent. The object being primarily *to produce gas*, and the by-products (coke and tar) being entirely superfluous to that end, the actual result should be stated thus:—

Heat originally in coal, B.th.u.	...	100
Heat remaining in residue ...	...	52
Heat operated on in gas manufacture		48

Of the last-named quantity. 23 B.th.u. is contained in the gas, and 25 B.th.u. is lost. The efficiency of conversion is therefore at the most 48 per cent. ($100 \times 23 \div 48$), not 75 per cent. Moreover, the heat not usefully operated on—namely, that remaining in the coke and tar—is rendered less readily available than in its original lodging, and is therefore depreciated in value.

The Strike and Electrical Exports.

It might reasonably have been expected that our electrical export trade during the month of May would be very seriously affected by the general strike, but the recently-published Board of Trade return does not present a picture fulfilling expectations, which, for once in a way, is all to the good. The decline from the April total was only £40,878, but then April was itself a bad month. A better comparison is with the corresponding month of last year, but this shows an apparently appalling drop of over half a million. An examination of the details, however, provides an item of information which, while not entirely discounting the decline, goes a long way towards explaining it. We refer to the huge fall in the value of exported submarine cable—from £373,597 to £246. This particular section for obvious reasons cannot be excluded from the table which we prepare from the Board of Trade return each month, but its almost fantastic movements make fair comparison practically impossible. In the case under examination its exclusion would have reduced the decline from the May, 1925 total to £176,784; this, of course, is a fairly large decrease, but matters are given a considerably more favourable appearance.

The decrease as compared with the corresponding month of the previous year was £364,209 in January and £406,367 in April, of which submarine cables accounted for £259,193 and £278,195 respectively. This appears to show that, in spite of the general strike, the position was not much worse in May than it was in January and April. A similar explanation serves to show the reason for the decline of £1,109,770 in the total for the first five months of the year as compared with January-May, 1925. The net decrease in the value of exported submarine cable during this period amounted to £919,041.

It is thus clear that the electrical industry generally is not losing its export trade, and we have no doubt that the remaining seven months of the year will witness greater activity if the coal dispute is soon settled and further industrial troubles are avoided.

Servants and Electricity.

We wonder whether those who are already doing such excellent work in organising what we may term the woman's side of electricity supply are devoting attention to the household domestic. Electricity is sometimes credited with providing a solution to the servant problem. It may well happen that when full use is made of electrical appliances the number of domestics required will be lessened, and beyond all possible question the change can lighten the labour of the one solitary maid or the daily help, and what is even better still for very large numbers of people, it can lessen the strain upon the busy wife and mother. But the servant and her likes and dislikes—shall we say predilections and prejudices?—particularly the latter, require a good deal of careful attention. Electrical women of tact have here an excellent opportunity for the exercise of their peculiar gifts in dispelling ignorance and removing prejudice. We heard recently of a public personage in a particular locality who, impressed at a local showroom with the merits of the electric vacuum cleaner, electric fires, and so forth, ordered delivery thereof to be made at his abode, but unfortunately he had not previously consulted those in authority, and to his bewilderment he found that either those appliances or the established domestics would have to go. Of two evils he chose the lesser one, and so chooses still, preferring to forgo the delights of electrical advance for a season rather than to dispense with the pleasures of domestic felicity. Who has not heard, too, of menservants who make use of certain electrical contrivances for a time, but when the novelty wears off or when something, however slight, gets out of order, leave them unused?

In most cases we believe that initial prejudices of servants can be overcome as the result of experience of the benefits attending practical use of apparatus, but perhaps we have been too solicitous for lightening the load of the mistress by solving her servant problem and have paid too little attention to the thoughts, limbs, and wishes of the maids themselves. Electrical women will know how best to reach them, to educate, and to convince them.

Supplies to Outlying Districts.

The paper read by Mr. S. E. Britton on the first day of the I.M.E.A. Convention was intended to draw attention to the advantages of extending the operations of existing electricity supply undertakings into the surrounding districts, and the difficulties which impede that process; no one is better qualified for the purpose than the author, who has had plenty of experience under both these heads. As he eloquently demonstrates, the electricity supply industry in this country has been, to say the least, unfortunate in the legislation with which it has been favoured, and even the working of the Act of 1919 fails to gain his approval. Mr. Britton, in fact, is a wholehearted advocate of freedom for individual undertakers to develop their areas with the minimum of administrative interference. It was very clearly evident at the Convention that there was a strong current of opinion in municipal circles adverse to the Electricity Bill in its original form, and that the interference with local management which appears to be threatened is strongly resented, particularly by the larger undertakings. There is a widespread feeling that development should proceed on normal lines, without the adoption of artificial methods which are likely to increase the cost of electricity where it is already cheap, in order to reduce the price where it is unduly high. The views to which we have on many occasions given expression were, in fact, generally endorsed both in public and in private.

With Mr. Britton's comments on the undue stringency of the regulations for overhead lines, the difficulties in obtaining wayleaves, and the many other obstacles to the erection of aerial conductors, we are of course in the fullest agreement. Not only is the industry overburdened with harassing regulations and cumbrous procedure—it is also hampered by exaggerated reverence for private rights, which are allowed to restrict development to an extent unheard of on the Continent and in America. It must be realised that the supply of electricity is a public service, which must not be subordinated to the whims of private persons or the wayleave cupidity of the owners and occupiers of land. We do not suggest that electrical undertakers should be granted autocratic powers to ride roughshod over private rights; but they should not be at the mercy of every profiteer that they encounter, nor should they be required to wait for months before wayleaves can be obtained. As Mr. Britton urges, the procedure should be immensely simplified, and should be in the hands of local officials. Why this important matter has been omitted from the Bill is incomprehensible.

The Clyde Valley Electric Power Co.

Hydro-Electric Power Developments.

THE present consolidated position of the Clyde Valley Power Co., which came into being in 1901, abundantly justifies the foresight of its founders, and Mr. E. T. Goslin, M.I.E.E., chief engineer and manager, maintains the enterprising and far-sighted principles set up by his distinguished predecessors in the general management. There is an unmistakable spirit of enthusiasm and zeal for electrical development permeating the whole staff, which is sensed throughout the entire one thousand and thirty-three square miles of the company's allotted area.

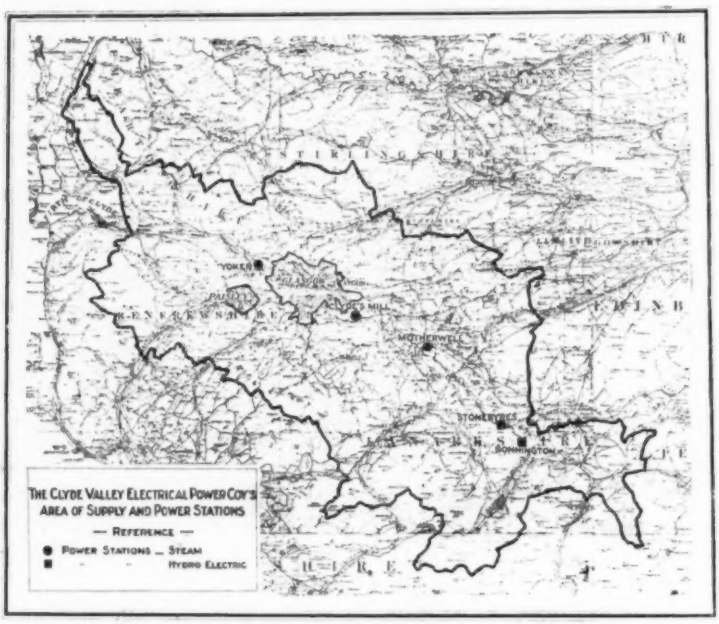


Fig. 1.—The Clyde Valley Electric Power Co.'s Area of Supply.

The two original stations, at Yoker and Motherwell, planted strategically on the river banks, one below and the other above the Glasgow boundaries, bore the vicissitudes of the early years. The varying fortunes of the steel works and collieries around Motherwell and of the shipyards and repair shops at Yoker kept the economic load fluctuating rather more than was desirable to enable the best results to be obtained; so in 1910 the almost prophetic step was taken of linking-up these two important distant stations by a through line, skirting Glasgow on the south. Remunerative progress was then assured, and within three years from the time of inter-connection the maximum load on the system had more than doubled, and had passed 10,000 kW. The next important step in the company's growth was marked by the establishment of the station at Clydes Mill, which grew with great rapidity during the war to super strength, and is most favourably adapted for further extension. These three generating stations now distribute to the area through 253 sub-stations. The accompanying Table I indicates the recent output, and illustrates the important group of key industries served by the company.

TABLE I.—ANALYSIS OF RETURNS.
Year ended December 31st, 1925.
SUMMARY OF OUTPUT AND REVENUE.

	Gross energy sold		Amount received	Av. price per kWh. sold
	kWh.	%	£.	d.
1. General power users	29,889,373	17.55	135,249	1.086
2. Collieries	31,072,709	18.24	120,351	.929
3. Textiles	4,200,871	2.47	20,454	1.168
4. Bulk	30,411,102	17.85	69,534	.548
5. Traction	1,831,811	1.08	11,535	1.511
6. Engineering & repair shops	21,483,976	12.61	103,629	1.157
7. Shipyards	14,168,207	8.32	62,654	1.061
8. Iron & steel works ...	37,268,463	21.88	107,573	.693
	170,326,511	100	630,979	.889

The installed plant capacity of the Yoker station is 35,750 kW, that of Motherwell 18,000 kW, and that of Clydes Mill 50,000 kW, giving a total for steam generation of 103,750 kW; this will be increased by 15,520 kW when the new hydro-electric plant is ready—probably by the end of the present year.

The Hydro-Electric Scheme.

This is a most important development of the activities of the company, representing as it does the linking-up of hydro and steam generating stations for varied industrial supply over a wide area.

British rivers have not the abundant natural reserves to be found in some larger countries, and adequate storage methods involve great expense. Isolated hydro-electric stations can only give a constant efficient output if designed for dry-season conditions. It would therefore seem that the peculiar problems of the utilisation of this country's coal and water-power resources are being happily solved in the Clyde Valley, where the large steam stations are located at the centre of the coal-producing districts and linked with hydro stations of a capacity sufficient to employ the available water power. The water, much or little as the seasons decree, goes to conserve the coal. The torrents and snows of the distant hills in winter give work and warmth and light in the towns, and in future springs and autumns the coal stations will pay back their debt to the country places and to agriculture.

The Falls of Clyde have long been places of pilgrimage by lovers of beauty. The Bonnington Falls are a mile or so upstream from the town of Lanark, and the Stonebyres Falls are downstream from that town. The latter, being the more easy of access, are the better known to visitors; but the Bonnington group has more grandeur, as there, after an impressive cascade, the river sweeps onward through a half-mile chasm, with perpendicular rock walls, and then at Corra Linn falls sheer into a reverberating and deep cavernous basin. The

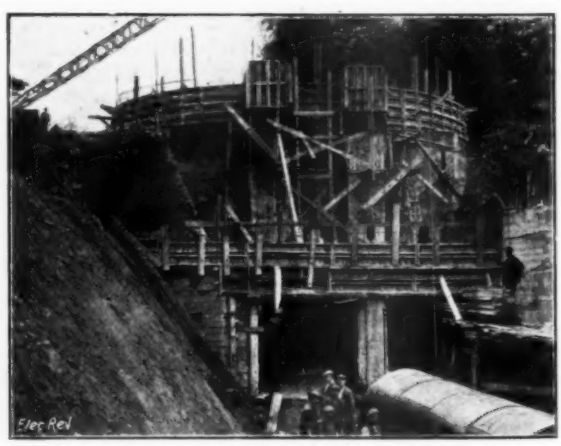


Fig. 2.—Bonnington Surge Tank, showing Pipe-line Exit.

Falls, and the works of the company associated with them, were visited by the members of the I.M.E.A. during the annual Convention which was held at Glasgow last week.

The Bonnington Scheme.

This "Astounding Flood!" in Wordsworth's phrase, is now being trapped to form the upper of the new hydro-electric stations.

The two schemes have much in common. In each a sloping intake at the weir leads to a subterranean tunnel, and each of the tunnels feeds a pair of steel pipe lines which run from a surge tank to a pair of turbines in the corresponding station. The Bonnington station utilises two falls, *i.e.*, Bonnington and Corra Linn, and has a longer tunnel and pipe line with a higher available head, while the lower scheme at Stonebyres has a greater volume of water to deal with.

A weir is in course of building above the Bonnington Falls, and the power house for this scheme is placed about one hundred yards below the Corra Linn Falls, the total head of water being 189 ft. from weir to tail-race.

The Weir.

The weir is of novel construction, having three automatic tilting gates of steel, fixed to a concrete sill on knife-edged pivots. Each gate has counterweights in the form of floating iron boxes. When the river rises the tilting gates are depressed and so guard against undue flooding; during highest flood level the tilting weirs are levelled right down to the river bottom, and the fact that the counterweights are of the floating type ensures that the gates do not rise till the waters have abated.

Fig. 4 shows the present stage of construction of this weir, with the river diverted to half its normal width by a temporary dam. The picture also shows that the reinforced-concrete pillars which flank the gates carry a bridge roadway. A hand-operated sluice gate is fitted on the right of the weir.

The intake is also at the right of the weir, in the foreground of the picture. It is 50 ft. wide, and is

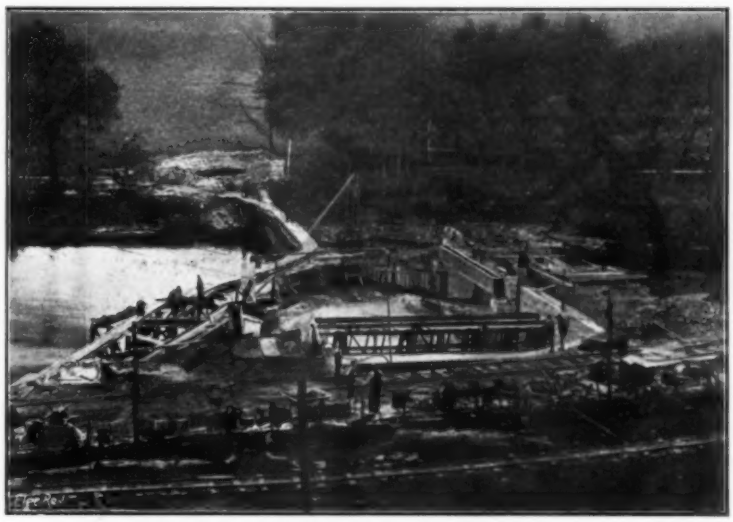


Fig. 4.—Bonnington Weir under Construction.

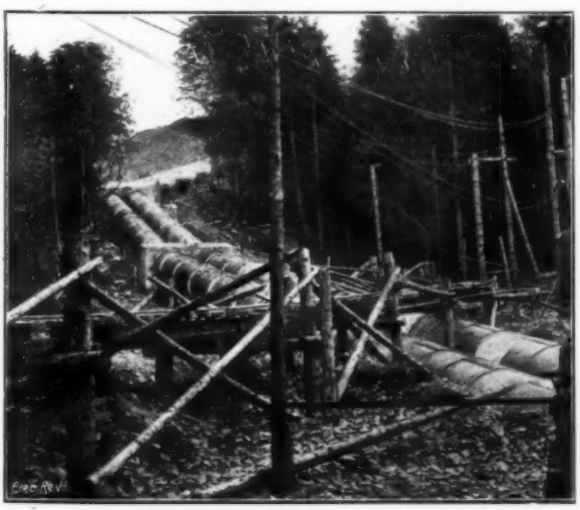


Fig. 3.—Bonnington Pipe-line, showing Anchor Blocks.

fitted with screens which are inclined to the horizontal at 60 deg. The parallel-rod screens are arranged in portable rectangular grid sections lying in guides. The sections can be readily raised for special cleaning if required.

Between the rough and the intermediate screens the bottom of the intake is formed into an efficient sludge trap channel, which can be flushed out by means of two sluice gates.

The Tunnel.

The bottom of the intake slopes to the tunnel mouth, which is fitted with a sluice gate and inspection shaft. The tunnel is 10 ft. in diameter and 773 yards long, with a slight inclination.

While a great part of the tunnel track is through rock, some difficulties had to be overcome where shifting sand and water were encountered. These places have been cleverly and skilfully dealt with by a cementation process; this has the effect of making the liquid sludge encountered into a powdery rock which can be readily tunnelled. The sludge is pierced at numerous points by long tubes, and a mixture of cement and silica is then forced at great pressure through the tubes, the pressure being maintained while the tubes are being gradually withdrawn. In a short time the cement sets and cakes its surroundings.

Cast-iron bolted segments are being used to line the parts which are not cut through solid rock. The entire inner surface is finished off with smooth cement. The tunnel ends in a circular reinforced-concrete surge tank, which measures 61 ft. across. The surge tank is provided with a fine screen and arrangements for discharging silt and *débris*. Bell-mouthed exits are provided for the pipe lines. Two steel pipe lines, each having sluice gates, run from the surge tank down to the turbines in the power house. The sluice gates are separately controlled by oil pressure from the pump which supplies the oil-operated turbine governor relay valve.

Fig. 5.—Stonebyres Falls.

Pipe Lines.

The steel pipe lines are each of 6 ft. 6 in. internal diameter. The riveted plates have a minimum thickness of $\frac{3}{8}$ in. for the upper portions, increasing to 9/16 in. at the lower end. The pipes are provided with massive concrete anchor blocks and supports, and lie on plate cradles grooved for the entry of rust-preventing grease. Expansion joints and inspection doors are provided, and the pipes terminate in two hydraulic balanced valves inside the power house.

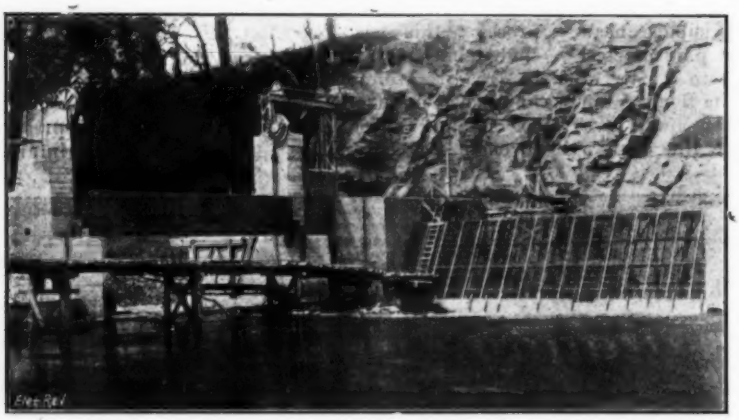


Fig. 6.—Stonebyres Weir, showing Intake Screen and Tilting-gate Counter-weight.

The Bonnington Station.

The station buildings are pleasing in design, and strike no harsh note with their surroundings. It may be said here that nowhere in these schemes do the buildings, weirs, or works obtrude or clash with the natural beauty of the district. For this no doubt great credit is due to the special Amenity Committee which considered this important aspect of the matter.

The station is of the one-floor type, and the turbine house measures 97 ft. by 37 ft. 6 in. The main space is, of course, to be occupied by the two turbo-generators. A gallery 8 ft. above the floor and running across the station carries the e.h.p. control board. The low-pressure a.c. and the d.c. switchboards are placed beneath this gallery.

An annex on the downstream side of the turbine house will hold the 11,000-volt switchgear, booster transformers with regulating gear, and a battery for the control mechanism.

A portion of the annex is allotted to the e.h.p. switchgear, and has room for 12 lines of main switchgear. Another portion houses the station auxiliary transformers and the booster transformers for the main transmission lines, the regulating switchgear being immediately above. A house for the senior attendant, with workshop, &c., is placed at the upstream end of the building.

Fig. 7.—Surge Tank at Stonebyres.

Turbines, Alternators, and Auxiliaries.

The circular foundations are now set for the two turbo-alternators. The machines will run at 375 r.p.m., and will be of the vertical reaction type, each of 6,750 h.p., coupled to a 25-cycle, 11,500-volt alternator of 6,150-kVA output.

Each turbine will be provided with an automatic governor with servo-motor and connecting gear to control the swivel gates for the water. A time-lag relief valve is to be provided to divert the water to the tail race, which will act upon a sudden cessation of the load.

The governors will be provided with a return motion gear coupled through a relay to a float at the intake works. Thus the degree of opening of the turbine gates will be regulated according to the water available in the river. The vertical-shaft generators will be directly coupled to the turbine shafts, and the exciters will be carried on shaft extensions.

The auxiliaries will include a motor-generator charging set for the batteries, one motor-driven oil pump for the governor and head-bay sluice gates, one water-wheel coupled to an oil pump as stand-by to permit of the station starting up independently of an outside electricity supply, and two 50-kVA transformers for auxiliaries and local lighting.

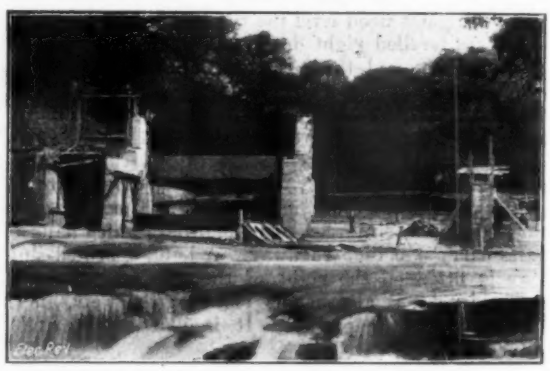


Fig. 8.—Tilting-gate Fully Open with Sluice Gate on Left.

The total output of Bonnington station, with a water flow rate of 825 cu. ft. per second, will be $4,920 \times 2 = 9,840$ kW at 0.8 power factor.

The Stonebyres Station.

Stonebyres is about three miles further down the Clyde from Bonnington, and will utilise the water which will be returned to the river from the upper station. The stream is augmented by the tributary stream, Mouse, which reaches the Clyde above Stonebyres, and the catchment area is 54 square miles additional to that serving Bonnington; it embraces 385 square miles net and has an average annual rainfall of 43 inches.

Tilting weirs are also employed at Stonebyres, and these have been modified to suit the altered configuration of the river. The intake and screen arrangements are similar for both stations.

At Stonebyres the tunnel, surge tank, pipe lines, turbines, &c., are all of similar type to those at Bonnington, but with the slight modifications in design required to deal with the increased water flow rate which will be 911 cu. ft. per second. The tunnel here is shorter, being 492 yards long, and its diameter is

11 ft. The total working head from weir to tail-race is 97 ft. 6 in.

The twin pipe lines are, at Stonebyres, comparatively short, and no relief valves or hydraulically-operated valves are being provided on the turbines, the water entry to the pipes being controlled by oil-pressure servo-motors.

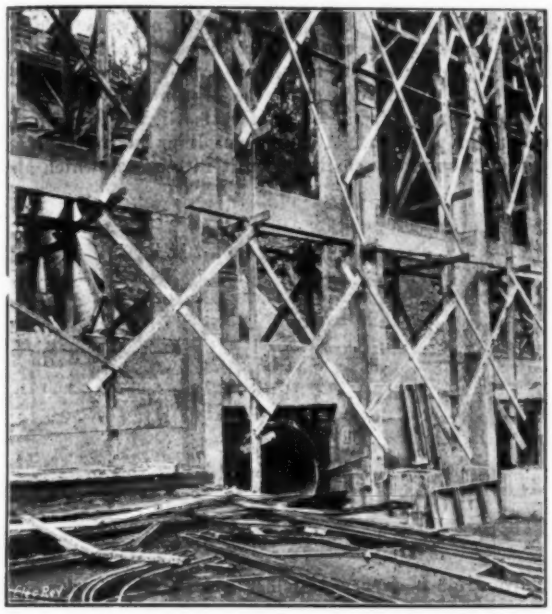


Fig. 9.—Stonebyres Station, showing Pipe-line Entrance.

The turbines and general design and equipment and the buildings are all like those at Bonnington. The normal speed of the turbines will be 375 r.p.m., and each is to be coupled to a 2,840-kilowatt, 11,000-volt alternator. The total output of Stonebyres station will be, therefore, 5,680 kW, as compared with 9,840 kW at Bonnington.

To correct voltage fall between stations, the plant at Bonnington has been designed for normal working at 11,300 volts, and that at Stonebyres for 11,000 volts.

Transmission Scheme.

Bonnington and Stonebyres will be linked by two interconnectors consisting of two 3-wire lines on separate pole routes.

A north interconnector to the steam generating system, consisting of a six-wire overhead line on one line of poles, will go direct from Bonnington to the Overton switch-house on the existing Clyde Valley Co.'s 11,000-volt network, traversing the burgh of Lanark, the town of Carluke, and the villages of Law and Braidwood.

A south interconnector of similar construction will join Stonebyres with the Motherwell station. This line will serve Larkhall, Stonehouse, and Strathaven.

A third direct transmission line will connect the Stonebyres and Motherwell power stations.

The necessary correction of line voltage will be dealt with by boosters at the different stations, and, where required, these will have their current and pressure windings split to form part of the split-conductor protective scheme.

At the towns and villages through which the lines will pass, the necessary transforming arrangements are being made for local supply.

The placid flow in the upper reach of the river gives place to the spectacular double falls at Bonnington, where the channel traverses a rocky gorge and half-mile chasm between perpendicular cliffs from 70 to 100 ft. high, the site being one of the few in this country where hydro-electric power development of any magnitude is possible without the aid of costly storage reservoirs. The undertaking of the scheme, by the Clyde Valley Electric Power Co. and its associate, the Lanarkshire Hydro-Electric Power Co., reflects great credit on all concerned in it.

The civil engineering and building constructional work is being carried out by Messrs. Sir Wm. Arrol and Co., Ltd., to the designs and specifications of Messrs. Buchan & Partners. The electrical and hydraulic plant equipment is by the English Electric Co., Ltd. The work is being superintended by the Clyde Valley Co.'s engineers under the direction of Mr. D. Macfarlane Mcleod, to whom, and to the chief engineer, Mr. E. T. Goslin, we are indebted for facilities to prepare this article.

Fig. 10.—Stonebyres Power House in Course of Erection.

Demonstrating Radio Apparatus.

A New Idea—Take it to the Customer's House.

By PAUL D. TYERS.

Now that the wireless public is becoming more critical and is beginning to realise the possibilities of true reproduction, the subject of demonstration is one to which greater attention must be paid than has hitherto been necessary.

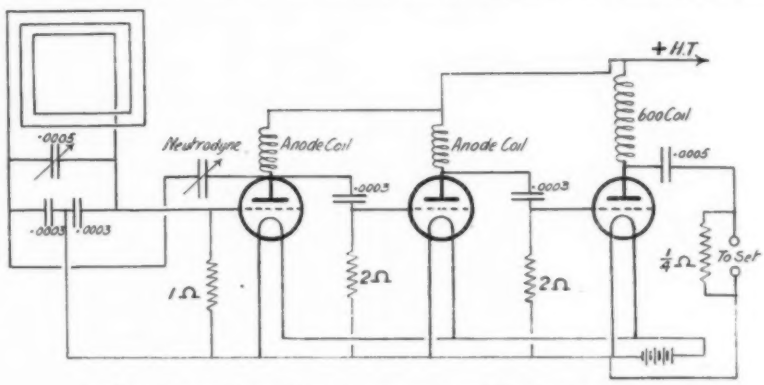
It is frequently of little use trying to convince the possible customer of the capabilities of some particular receiver merely by the usual form of sales promotion literature. The prospective purchaser is usually instinctively sceptical, and a demonstration is the only possible way to stimulate any real interest. Here, again, the trader may find another obstacle in his path, due merely to apathy. Once he can persuade his client to come into his showroom and listen to a demonstration of the set, he certainly has a very good chance of making a sale, provided, of course, that the instrument gives a sufficiently good performance. In nine cases out of ten, however, it is only with the greatest difficulty that this type of client can be persuaded to summon sufficient energy, or take sufficient trouble, to be interested to this extent. If, then, a sale is to be made, and the proverbial mountain will not come to Mahomet, Mahomet must go

to the mountain. In other words, the trader has to take the set to his client's house.

Usually the trader is debarred from demonstrating in the client's house owing to the absence of a suitable aerial and earth, and such a procedure has usually only been possible when the set is of the portable or frame aerial type.

However, it is really very easy to build a portable amplifier which can be substituted for the aerial and earth system, and used in conjunction with any ordinary type of broadcast receiver, thereby enabling a demonstration to be carried out almost anywhere, and under any conditions. In order to avoid a multiplicity of tuned circuits and not to introduce complication it is preferable to build an amplifier of the impedance-coupled type, so that there is only one tuning control, that is, the frame condenser. Several types of semi-aperiodic anode impedances are on the market, and these can conveniently be used. The accompanying diagram illustrates a three-valve, high-frequency amplifier used in conjunction with a frame aerial on the lines suggested. A neutrodyned input circuit is employed, and if a centre tap frame is not available the arrangement of two condensers shown in the diagram should be utilised. The anode circuits of the first valves contain tapped anode impedances of any well-known make, while the anode circuit of the last valve contains an inductance such as an Igranic 600 coil. The output of the amplifier is taken from a small condenser of about .0005 mfd., and a ¼-megohm grid leak, the two output terminals then being connected to the aerial and earth terminals of the set. Common batteries may be used for the frame amplifier and the set if desired, but it will probably be found essential to use condensers across the high-tension tappings in order to prevent parasitic oscillation.

When demonstrating with a frame amplifier of this type care should be taken, if working very near to a broadcast station, not to blast the set by obtaining too great a potential on the grid of the detector valve. This trouble can very easily be eliminated, preferably by rotating the frame so that it is slightly out of the maximum position. A frame amplifier of the type referred to can very easily be built into a case which also contains the batteries for both sets and the frame aerial itself. The cost of building the frame amplifier is comparatively negligible, and it should prove of great assistance in demonstrating anywhere. If desired, the frame amplifier may be provided with outside aerial and earth terminals, so that it can be used to boost up signal strength when only a very poor aerial is available. Here, again, the frame amplifier should be found valuable for demonstrating in public buildings, when, usually, far from efficient temporary aerials are to be obtained.



Portable Three-Valve High-frequency Amplifier and Frame Aerial.

The Electricity Supply Bill and the Consumer.

By R. W. WEEKES, A.M.Inst.C.E.

THE President of the Institution of Electrical Engineers, in his constructive criticism of the above Bill, published in your issue of April 30th, states his opinion that—

> "Our backwardness in the use of electricity is due rather to the inefficient and hampering legislation of the past than to the shortcomings of the electricity undertakings."

This is not borne out by Section 12 of the Report of Lord Weir's Committee, which reads:—

> "In using these figures it must be remembered that they include only the consumption from authorised undertakings. In this country, due to the existing high price of electrical energy, in many parts of the country, and the dependence on small generating stations, many industrial users and private persons prefer to generate their own electricity. The amount of privately generated current is not accurately known, though a census was made in two given areas to form some opinion. It is estimated that if energy from every source, both public and private, were included, the consumption per head in this country would be raised from 110 units to about 200."

If this estimate is correct, 45 per cent. of the electricity used in this country is still produced by private plants, and this is a serious reflection on the authorised undertakers. In my experience several plants have been installed due to the high prices asked for a supply by the authorised undertakers of the districts in which they were situated. To give two cases: Some years ago I acted for a large concern in the Midlands which worked continuously from midnight Sunday to mid-day Saturday. The load factor was unusually high in consequence, but the engineer of the supply undertaking concerned would not quote lower than 2d. per unit. He stated that the price for power had to be high because there was no demand for power in his district. In point of fact his argument should have been reversed. There was no considerable demand for power from the public because the price asked was too high. His successor, some five years later, fixed up a contract with me for some other clients for a smaller factory, working ordinary hours, at a price just over 1d. per unit. Under new management this supply undertaking has grown rapidly, and the present rate of increase is above the average. The other case, within the London area, is quite recent. At a factory with normal hours and a maximum load of about 350 kW, large extensions were to be made, and the question of a new private plant *versus* a supply from a company's main had to be decided. The price demanded averaged 2.55d. per unit, and the larger private plant was installed.

Supply for lighting is, in many places, equally calculated to prevent consumers from coming on or mains being laid to supply them. Last year I built a house about 12 miles from London, on a new estate. The Metropolitan Water Board, the Gas Company, and the Post Office Telephone Department laid their mains down the newly-made roads to serve the first houses built. The electricity undertakers had a high-pressure main in the road bounding one side of the estate, but it took 11 months to get them to lay a low-pressure cable up my road, and a scheme to put down a private plant to

supply the estate was practically completed before the company would move. The charge is 10d. per unit for light and 3d. for heating, which naturally prevents many inhabitants from taking supply. It limits the use of electric heating and makes electric cooking prohibitive. My conclusion is that past legislation is not responsible for the above cases, but that the undertakers failed to exercise their powers properly.

The influence of cost of supply on demand is not recognised by some undertakers, as the curve published in Section 13 of the Report of Lord Weir's Committee shows; or else they deliberately prefer to supply a few consumers at a high price rather than deal with a larger output and many consumers. The following comparative figures for two residential areas near London of about the same population bear this out:—

Year ended		Pop. about	Units sold	Total revenue	Av. Price obtained per unit	Units sold p. hd.
Dec. 1924	Bromley & Chislehurst	44,000	1,552,963	£48,555	6.9d.	35.3
Mar. 1925	Tunbridge Wells ...	46,700	3,022,302	£42,623	3.20d.	64.5

Perhaps in the above comparison, past legislation had some influence. The Tunbridge Wells Corporation has the security of tenure that the 1888 Act gives to municipal bodies. The Bromley Electric Light Company may lose its powers in 14 years, and hence the directors may not find it easy to raise further capital for the larger mains so urgently needed. In the meantime the inhabitants suffer from the restricted supply which is the result of high prices. At Tunbridge Wells the units sold have increased 140 per cent. in the last four years, while at Bromley the increase has been only 54 per cent. To carry the comparison further, neither of the two undertakings is well situated as regards coal and water. In spite of this, Tunbridge Wells accounts show a works cost of 1.67d. per unit sold. At Bromley a large part of the energy is purchased in bulk, and yet the works cost per unit sold was 2.98d. for the corresponding year. It is on this figure that the Electricity Supply Bill will have effect if Parliament passes the measure. It is certain that the proposed Central Electricity Board could give bulk supply to both these undertakings at a price below the figures quoted above, and the Board can also insist on the benefit being passed on to the consumers. This would be done under Clause 14 of the Bill, which reads—

> "Where in any year the Board notify to any authorised undertaker owning a generating station, not being a selected station, that the Board are in a position to supply directly or indirectly to those undertakers the whole quantity of electricity required for their undertaking on specified terms, and are satisfied that the cost of the supply on those terms is below the then prevailing cost to those undertakers, and those undertakers refuse or within three months after such notification fail to agree to take such supply directly or indirectly from the Board, then, if the Electricity Commissioners are satisfied as respects the next subsequent year that the cost of production of electricity generated by those undertakers substantially exceeded the cost they would have incurred had they purchased the like quantity of electricity directly or indirectly from the Board on the specified terms, the Electricity Commissioners shall by order require the authorised undertakers to make such abatement from the rates and charges for electricity for the ensuing year that the estimated aggregate amount of the abatements will be as near as may be equal to the amount of such excess as aforesaid."

The duty of the Board will be to supply electricity to authorised undertakers, and the Bill is drafted to give it full powers to insist on the supply being taken. This will enable the generation of electricity throughout the country to be organised on lines which cannot be followed with the existing legislation. The latter was too parochial in character, but it has enabled the large corporations to deal effectively with the supply of electricity within the municipal boundaries. Mr. Chattock's undertaking is a case in point, but the Corporation of Birmingham cannot be expected to finance the supply in bulk to an indefinite surrounding district, the various parts of which can individually accept or refuse supply. The strength of the present Bill is the fact that the Board will deal with the country as a whole, and can prepare schemes on engineering lines with the assurance that the whole of the demands for electricity will eventually be handled. Under such a scheme the money now frequently spent on introducing inefficient plants will be saved. In my opinion the financial proposals of the Bill are a most important feature, and in no other way could this national scheme be quickly started. I gather that Mr. Chattock would prefer a partial scheme, to do in districts what the Bill proposes to do for the whole country. This would avoid, for the time, the expenditure for standardisation, but in the future this matter would have to be handled, and the cost then would be greater, as larger plant would then have to be altered.

The recent general strike gives a further reason for the adoption of this Bill, and for the generation of electricity being put in firmer hands. The majority of the undertakers continued to give a general supply and called in volunteers to replace the men on strike. There were other Corporations with Labour majorities who cut off supply during the day, and so shut down factories, the employés in which were all willing to work.

The Need for Accurate Costing—Why Wait?

A Suggestion for Speeding-up the Incipient Trade Improvement.

(COMMUNICATED.)

(*Concluded from page 910.*)

To write so much about the need for seeing that a day's work is obtained for a day's pay may seem to be making a long story of an obvious platitude, but it is nevertheless a truism that is more often neglected than acted upon. Were a little more attention paid to this measurement of services obtained for money spent, of work done for overtime wages paid—and there is room for more of it in some nine firms out of every ten—there would be heard much less of the outcry against high costs of production, and far greater attention would be devoted to reducing them. It is by means of such measurements that those who believe their costs are too high, can find out in what particular direction unnecessary expenses are being incurred.

If the necessity for providing some such means of measurement is clear, surely the power and possibilities of control that will be the natural outcome of the constant and careful application of such an instrument must be even clearer. The comparison of work done for wages paid (on day work as compared with piece work, for instance) not for the factory as a whole, which would be a mere average, but for each or any distinct department, or process or operation, or if need be for each man, must very quickly show where delays are taking place, or where time is being lost. Once the source of the trouble has been traced, the reason for its existence can quickly be discovered. It may be found that there is too much work in the shop for one crane to cope with, or there may be insufficient tools, so that men have to wait about till their fellows have finished with them, or lack of supervision may be shown to be the trouble. Loss of time and material may be due to a thousand and

one things, in many of which it is impossible to *see* a fault; only from defects of which they are the *cause* can their insufficiency be detected and made known.

The present age is always glad to hear about instances of slow production, not so as to provide an opportunity of "getting at" the men concerned, but rather to find out the reason for the delay, so that steps may be taken towards its removal. It is this means of measuring that provides the central agency for such news. Much has been heard recently of the need for a new spirit of co-operation in industry. Very often it is just these delays in production, once the management gets to know of them, that provide the opportunity for this new spirit to show itself, by having things put right to the mutual advantage of the workmen and the company.

A monumental example of what has already been done by applying this measuring stick, on an international scale, is to be found in the "Inquiry into Production," published (only in French) by the International Labour Bureau, at Geneva. Two extracts will be quoted:—

"Owing to the improvements in methods of production in the steel-making industry of the U.S.A., whereas the number of workers in the industry in 1850 was 20,298. it has only increased in 1919 to 38,243, yet the tonnage production has gone up from 504,245 to 31,015,364. The number of workers is barely doubled, yet the production is 60 times greater."

"In 1921 the output per worker in the British cotton trade is given as only 50 per cent. of what it was in 1913."

These comparisons are, as has been said, measurements on an international scale, and though highly informative, are far less valuable for the purpose of showing where there is a possibility of cost reduction, and greater economy, than would have been similar comparisons for individual factories, or even sub-divisions of individual factories, but they do typify facts that matter in a business.

If, then, there be admitted the need for, and the advantages of, some such measuring instrument to compare services obtained for money spent, it remains but to show, in a more definite manner, how such means can be provided. This, fortunately, is not difficult if those who read have but the little foresight and enterprise necessary to make the experiment for themselves, and are prepared to shun rule-of-thumb methods as they would the plague.

As is truly, but very necessarily pointed out in this "Inquiry into Production," you cannot explain the facts, until you know the facts! Yet, how many directors of companies engaged in the manufacturing industries of this country are there who really do know the facts about all that is going on in the factories they control? There may be many good reasons and excuses why directors are not in the closest touch with every-day occurrences in their business, but there is absolutely no reason why they cannot have the fullest information about facts, both pleasant and unpleasant, which ought to be placed before them. If there is any waste or leakage not only of money, but of time, space, services, and material, then they can, if it be their desire, ensure that news of it reaches their ears. It is regretable that the number of directors who arrange to be supplied with such information is not far greater than it is.

An instance may be cited to show what befell one board of directors who failed so to equip themselves. This refers to a large firm engaged in the manufacture of cast iron pipes. In 1920, when the price of pig iron reached a maximum of about £15 per ton, the cost of these pipes became so great that a price high enough to cover the calculated cost could no longer be obtained, and the firm began to search for some alternative and cheaper pipe to offer in its stead. After some deliberation, they decided to commence manufacturing welded pipes made from sheet steel. Though much cheaper than cast iron, great difficulty was experienced in persuading customers that the new pipes were equally suitable for the purpose required. Cast iron pipes had always been used for the purpose, and a change to some cheaper, but possibly inferior, alternative was not at first relished at all. Customers still wanted cast-iron pipes, but they wanted them at a lower price than that for which they could be made.

Very gradually, however, this conservatism was overcome, and the sale of welded sheet steel pipes began to increase. People began to find that not only were they equally as serviceable though cheaper, but they were also much lighter than cast iron, and more easily held in position. Bit by bit the fashion changed, until to-day the welded steel pipe is in universal demand, and it is the cast iron pipe that is hard to sell for this particular purpose. Now, however, the price of cast iron and sheet steel have both fallen far below the maximum figures reached in 1920, and to-day a good grade of foundry pig iron can be bought for about £3 10s. per ton instead of £15—the 1920 price. The result is that a complete reversal has been brought about, and now the cast-iron pipe is the cheaper from the manufacturing point of view.

In this firm, so much energy had been expended by the directors upon inducing customers to overcome their objections to the sheet steel pipe, and so concentrated was their attention on this one object, that the measuring stick had been lost or forgotten, and though they, of course, were aware of the fall in prices that had taken place, they were entirely oblivious to the re-adjustment in cost that had accompanied it. It was not until some entirely different reasons led them to have installed an up-to-date system of costing, that these directors became aware of the true state of affairs.

An accurate method of costing, specially designed to suit the trade, organisation and particular conditions of the firm concerned, is the means by which this "measuring" that has been referred to, can be maintained in continuous operation. If properly and intelligently made use of, there can be no doubt that all that has been claimed will be realised by this means.

Many people seem to regard costing as a job that can be entrusted to a few clerks, and that it is, at best, only useful as a rough guide to what it has cost to manufacture the products of the firm during the year. A firm of rope and twine manufacturers of some repute in the trade, make a practice of adding together the cost of their purchases of hemp, &c., their wages bills, and their works and office establishment charges, dividing by the total weight of rope made, and believing that they know their costs. This pernicious habit of self-deception is then flattered by them with the name, costing.

Comparatively few people believe that costing can ever give really accurate results, or supply figures that are more than partially reliable. Even fewer are apparently aware that costing can claim to provide other information than what it has cost to manufacture.

If a company gets into low water, that is, if its auditors are unable to bring out the balance of the profit and loss account on the right side, then the first to feel the effects of the wild and desperate rush to reduce staff that follows are the few hapless cost clerks. "We cannot possibly afford the luxury of costing in bad times like these." In arguing how and where to economise further, the last place to which they turn for help or guidance is their cost system, though, did they but know it, it is the one and only part of their office organisation that is capable of pointing out where and how economies and savings can be made; where, in other words, the least service in return for money paid out, is being obtained. The financial accounts can only provide the cold fact, long after the mischief has been done, that the year's trading has resulted in a loss; they are powerless to show how and where.

As Sir Edward Grey repeats in his "Memoirs," "It is precisely the man at the centre who is often unable to see the wood for the trees," and the truth of this is always much in evidence immediately after the presentation of an adverse report by the auditors. In the haste to prevent a repetition at the end of the current year, already partly spent, the axe is wielded in a manner so ruthless, and the disturbance caused is so great, that often it is the really useful and necessary people that are hastily discharged, and the last state is worse than the first. The only way in which this affliction of the vision, which so often attacks responsible men at such times, can be guarded against, is to don the spectacles

provided by the cost system. By this means a clear insight into the workings of the business can be quickly and easily obtained.

Cost systems are often condemned and disregarded because they have this fault (though it can hardly be said to be the fault of costing), and that is that they are left in the hands of a few clerks. The cashier or perhaps the secretary of the firm may be nominally in charge of them, but these officials have their own allotted duties to perform, and little time to devote to costing, which is not their proper work, so it often receives neither their interest nor their best attention, even if they have the necessary knowledge of the subject to make a success of it, and this is but rarely the case. Inevitably, the cost results presented under such conditions are nothing but the work of a few clerks. The results may be correct, but they are not brought out or expressed in such a way that important and useful features will inevitably catch the eye of the directors concerned, even if they do happen to look at them at all.

Costing, like everything else, must be properly supervised if it is to be of any value. Clerks working on their own cannot be expected to produce this finish, which makes all the difference between a page of figures and really helpful and valuable statistical information. For one thing they are seldom in sufficiently close contact with the directors to know their policies, and what will help and interest them in endeavouring to carry them out. For another, if they could produce "finished" work, they would no longer remain clerks.

Costing is now rapidly becoming a separate and distinct science of its own. It is not accountancy, and it is not economics, but something between the two, and yet different from either. What really matters in the training of a specialist in costing is practical knowledge of the manufacturing process which he has to cost. Costing is primarily a shop problem. The greatest benefit is derived from its ability to help the shops to produce more economically and more cheaply, to help them to choose, not the machine that will produce the quickest, but the machine that will produce the cheapest; two things which are by no means always synonymous.

Though a little costing is now included in the syllabus of training of a chartered accountant, the majority of accountants realise and admit their inability to tackle costing problems, because they have had no opportunity of studying "shop practice." The wisest of them consequently leave costing to those who have made a special study of the subject, and have had the essential advantage of practical experience in the shops.

To such people, manufacturers who believe that their foundry costs, or their by-product costs, for example, or their selling costs ought to be less, will be well advised to turn for guidance in these matters.

The Royal Society's Soirée.

Annual Exhibition and Demonstrations.

THE Royal Society's annual conversazione was held at Burlington House, London, on June 16th. Sir Ernest Rutherford, O.M., president, welcomed Fellows and guests, and the usual scientific exhibits and demonstrations had been arranged; though they were not so numerous as in past years, they totalled 33, several of an electrical nature being amongst them.

Mr. W. M. MORDEY conducted some experiments of considerable interest, which demonstrated a strong rotation in multiphase fields of magnetic materials which are either non-conducting in themselves, or are made so by being reduced to powder and mixed with glue, or shellac, which electrically separates the particles from one another. Disks or cylinders of such materials were used, including magnetite, pyrrhotite, nickel, hard cast iron and hard steel grit. In such substances no appreciable eddy currents are produced, but they form induction rotors with no windings and no induced currents. The rotation, which is attributed to hysteresis only, is in the same direction as that of metal disks or cylinders placed in the same magnetic fields; loose powders of the same magnetic materials rotate in the opposite direction. No movement takes place either with moulded disks or with loose powders of non-magnetic metals, such as copper or aluminium, showing that no appreciable eddy currents are produced in powders even of good conducting substances.

Mr. A. C. DOWNING'S electrical instruments for physiological research included a simplified moving-magnet galvanometer of great sensitivity and short period, with a very light magnet system and a "mumetal" shield (Gutta Percha Co., strip wound alternately with copper and annealed at 900 deg. C. in nitrogen), which is claimed to cut out 99.9 per cent. of the external magnetic fields. He also showed thermopiles for measuring the heat production of muscle and nerve and, with Dr. Anrep, apparatus employing a hot wire for measuring the velocity of the flow of blood from a vessel during a single cardiac cycle. The hot wire wound on a thermopile used for measuring the strength of stimulus, or for "calibration," will measure 20 microamperes a.c. to less than 1 per cent.

Studies of radio-telegraphic atmospherics were the subject of the Radio Research Station's exhibit, in collaboration with Prof. E. V. APPLETON. A method of examining the wave-form of transient electrical impulses, involving the use of linear and unambiguous time-base with the cathode-ray oscillograph, was shown in actual application to the visual observation of atmospherics received on a local antenna; the nature of the time-base e.m.f. was separately demonstrated. Records of typical wave-forms of atmospherics observed in the tropics were on view, together with records of their direction of arrival and of the meteorological environment of their sources.

Dr. W. H. ECCLES, F.R.S., and Dr. WINIFRED LEYSHON showed a neon tube and tuning fork combination for producing electrical oscillations of harmonic frequencies suitable for calibrating wave-meters. When a neon tube is connected in parallel with a condenser and in series with a resistance and a battery, an intermittent luminous discharge passes through the tube as was shown by Pearson and Anson. In the exhibit such currents were passed through the coils of an electromagnet so as to keep a steel tuning fork in continuous vibration. For this purpose the electrical constants must be chosen so that the intermittent discharges have the same frequency as the natural frequency of the fork, and then the fork will react on the circuit and compel accurate isochronism. The current in such a circuit has many high harmonics, and, therefore, induces an oscillatory current of any chosen harmonic frequency in a neighbouring circuit tuned to that frequency.

Sir ROBERT HADFIELD, F.R.S., exhibited sample alloy steels for various special purposes, including specimens specially suitable where great resistance is required to withstand the effect of temperatures of from 800 to 1,000 deg. C.

A rotor with wheel, blades, and shaft machined from one piece of "ERA/ATV" steel was shown as used in the construction of exhaust-gas turbines. These rotors are driven by the exhaust gases from internal-combustion engines; they work continuously at a temperature of from about 800 to 950 deg. C., and run up to the very high testing speed of 53,000 revolutions and working speeds of about 30,000 revolutions per minute. These special steels possess not only a high resistance to

the corrosive and erosive effects of very hot gases, but also great mechanical strength even at a bright red heat, enabling parts made from this material to withstand exceedingly high centrifugal and other stresses.

A tuning fork of high nickel chromium alloy steel, with constant frequency at varying temperature was on view, the necessary characteristic of the material for such a purpose being a very low temperature coefficient of the modulus of elasticity.

The Clarendon Laboratory, Oxford, exhibited a photoelectric photometer (Prof. F. A. LINDEMANN, F.R.S., and Dr. G. M. B. DOBSON) built on the principle that two beams of light from an electric filament lamp traverse two different, but similar, paths and finally both fall on one photoelectric cell. A shutter allows one or other of the beams to be cut off; at one point the beams are brought to a focus, and the photographic plate to be measured is placed on a mechanical stage so that the focus falls exactly on the film. The second beam passes through an adjustable optical wedge, which is moved until the electrometer connected to the photoelectric cell shows the same deflection whichever path the light is traversing. The reading of the wedge gives a measure of the density, and in this way the density of very small areas, such as spectral lines, can be measured and high accuracy can be obtained, an accuracy of 1/10 of 1 per cent. being easily attainable.

The physical laboratories, Victoria University, Manchester, showed some ingenious models of crystal structure (Prof. W. L. BRAGG, F.R.S., Mr. G. B. BROWN, Mr. J. WEST). Crystals of BeO, of Al_2O_3, and of $BeAl_2O_4$ are very different in form, but a comparison of their structures has shown that the relative positions of the oxygen atoms are almost identical in all three. The shape of the structure appears to be determined by the large oxygen atoms, the metal atoms being inserted into the spaces between. The structure of the typical orthosilicates, olivine (Mg_2SiO_4) and monticellite ($MgCaSiO_4$), are exactly like that of $BeAl_2O_4$, while beryl ($Be_3Al_2Si_6O_{18}$) is another interesting example of a silicate with a simple structure. Photographs showed B-ray tracks associated with absorbed and scattered X-rays (Mr. J. M. NUTTALL and Mr. E. J. WILLIAMS) produced in a gas by a beam of homogeneous X-rays in a Wilson cloud chamber. The long tracks are due to electrons ejected from atoms which have absorbed a quantum of the incident X-rays; the short tracks are supposed by Wilson and Crompton to be due to this scattering of a quantum. A large number of photographs has made it possible to find accurately the relative numbers of these two types of track for different gases and wave-lengths. Mr. A. J. BRADLEY indicated the structure of "β" manganese and "γ" brass.

In Mr. W. A. DOUGLAS RUDGE'S mechanical models, which illustrate the structure of the atom, the electron is represented either by a small rapidly-rotating electric lamp, or by the negative glow of a vacuum tube. In the first form the lamp is rotated simultaneously about two axes at right angles to each other; a continuous line of light, by persistence of vision, is thus traced, cutting off a more or less spherical space, representing the envelope of the atom; the nucleus is represented by another lamp at the centre of the system. In the vacuum tube model, a system of tubes is so rotated that the anode glows are concentrated at the centre, forming the nucleus, whilst the cathode glows are distributed in the space outside.

The apparatus of Prof. O. W. RICHARDSON, F.R.S., for the investigation of soft X-rays consists of a tube in which very soft X-rays, varying in wave-length from about 20 to 400 Angstrom units, are produced by the electronic bombardment of solids; the tube is of transparent silica and is highly exhausted to a pressure of about one ten-millionth of a millimetre of mercury. The presence of the X-radiation was demonstrated by the photoelectric emission which it produces from a copper plate enclosed in the tube, the photoelectric current being detected by an electroscope. Diagrams showed the results of the excitation of characteristic X-rays and other effects at certain critical voltages, contrasting some of the properties of ordinary and soft X-rays.

The ROYAL ARSENAL, Woolwich, research department's display consisted of radiographs of general interest, showing, amongst other things, penetration of 4.5 in. of steel.

Dr. J. S. OWEN'S bore-hole alignment indicator was designed to guard against the fact that deep boreholes, driven by rotary drills, may deviate greatly from the vertical without the drillers being aware of the fact. To find the true direction a clinometer and magnetic compass, together with a clock, a contact-making drum, a battery and lamps, are enclosed in a brass tube about 4 ft. long, which is capable of withstanding considerable water pressure. The instrument operates in vertical, horizontal, or inclined holes, and the records are made at pre-determined intervals of time on strips of sensitised paper.

The METEOROLOGICAL OFFICE'S exhibit was concerned with the methods of measuring solar radiation, one of them being the use of a Gorczynsky pyrheliometer, which records direct solar radiation as it is made to fall on a Moll thermopile connected with a recording millivoltmeter; to avoid friction the pen is free, but is automatically pressed against the paper at short intervals.

Low-Pressure Distribution.

Some Particulars of a New Design of Network Box.

By L. R. LEE.

THE distribution of electrical energy at its final consumers' pressure, particularly over dense cable networks and in large towns, has never been the easiest problem with which mains engineers have had to deal. Electrically, the distribution of d.c. is more difficult than that of a.c. owing to well-known natural phenomena acting adversely with the former, but granting that the electrical troubles have been and can be largely overcome by good design and careful installation, there still remain other troubles—largely mechanical—to be surmounted, some of which are inoidental to the type of distribution-point unit adopted. Generally, it may be said that most networks are fitted with distribution points or units either in the form of above-ground pillars or underground boxes. In any case, the distribution unit is perhaps first of all called upon to provide efficient and quick action during fault times: that is to say, a fault having occurred, it is very desirable that discrimination between faulty and good cables should be automatically obtainable at the distribution point, and that the unit should lend itself easily to getting supplies going again with the minimum of delay. Agreeing that this is the correct suggestion, and that any fault should be so confined as to affect the smallest number of consumers, it follows that it is not correct practice to make what are known as solid tee joints on the distributors. On the contrary, each distributor should, as far as possible, be brought back to some well-defined distribution point, and there attached to other distributors and possibly to a feeder. If at this point each

distributor can be supplied through a thoroughly efficient cut-off, so much the better.

It will probably be agreed that until very recently, no really reliable cut-off capable of being used in the confined spaces left for a mains engineer's use in the crowded streets of our towns was obtainable, and therefore the existing best arrangement appears to be that, as far as possible, feeders are kept separate at their network ends and fitted with automatic circuit breakers at their station ends, the distributors forming open-ended branches from the feeder, being coupled to it through some solid form of connection, and thus, in case of fault, the whole tree—non-faulty as well as faulty distributors—is shut down. It now appears, however, that the above conception of the best method is seriously altered by the fuse lately perfected by Mr. Vernon Hope,

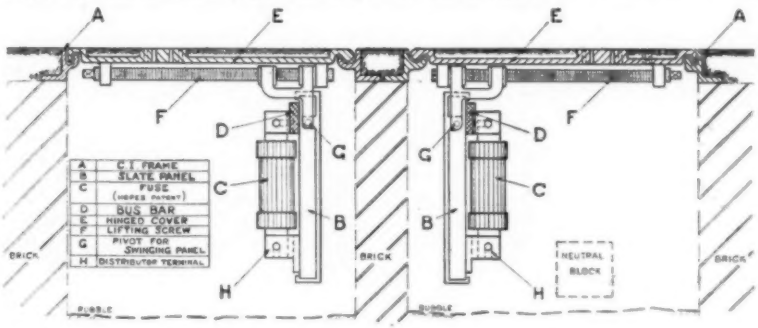


Fig. 1.—A 3-pole D.C. Distribution Box.

and by its use the writer suggests that it may be easily possible, not only to link together feeder and feeder to a reasonable extent at their network ends, but also to provide each distributor with a really reliable discriminating cut-off. Whatever be the method adopted, however, for ensuring continuity of supply to the greatest number of feeders, we have finally to decide on the type of distribution unit to be employed in the streets.

At the moment, the above-ground pillar has certainly appeared to find most favour, because operation at the distributor ends is so easily accomplished, but its great drawbacks are: (1) As it must be placed at the curb-edge of the footpath, it is frequently being knocked down by skidding motor lorries, thus resulting in heavy short circuits and the cutting-off of supplies to large numbers of consumers; (2) that the cable work in the bottom of the pillar is very congested and most difficult to get at; and (3) that some supply companies are unable to obtain permission to erect overground pillars from the road authorities in whose towns they operate.

With regard to underground network boxes, they are divided into at least two classes: (*a*) Those in which the electrical unit is erected in a more or less spacious underground chamber; and (*b*) those installed as cast-iron boxes, containing the electrical terminals, fuses, links and bus-bars mounted on an insulating base plate—forming a horizontal switchboard of small dimensions and horrible possibilities. One need only look at a drawing of one of these boxes to see what the possibilities are; for instance, when it is required to connect up all three (or four) poles of a feeder, and, say, four sets of multi-core distributor cables.

Summing up the troubles and disadvantages of underground boxes, we may say they are: In the case of (*a*), the necessity of a very costly drain connection to the sewer, the undesirability of jointers' work being done so far below the ground, the difficulty of adequate ventilation, and the very great overall cost owing to size; in the case of (*b*), we have the probability of short circuits occurring when connecting up and whilst in use, the troubles caused by condensation inside the box—the water finding its way below the compound level to the insulating base, the great difficulty of connecting new cables, and the trouble of lifting the lids when they have been in use for some time, owing to the oxidation of the jointing material between the lid and the box. And again, during working, if it is desired to withdraw the links or fuses, the operation has to be done below the street level and the operator's feet. When installing this type of box, the practice usually adopted is to put in short lengths of cables to fill up all the ways and to make straight joints on the cables outside the box, thus actually putting an extra joint on each cable. From the above it would appear to be distinctly advantageous if the best points of both the overground pillars and the underground boxes could be combined in one and the same unit, and the disadvantages of both eliminated.

The result of the writer's attempt to put an overground unit below the ground and to bring an underground unit above the ground so that the electrical gear may be in either place as and when required is shown by the accompanying illustrations. The designs have been made so that the "Hope" fuse, which should preferably be used in a vertical position, can be employed; but, of course, they permit the use of any other form of fuse or link.

Fig. 1 shows the design for a 3-pole d.c. unit distributing 2,000 amps. in four circuits, and the total space required for its installation is about 20 cubic feet, the depth of the containing pit being only 2 ft. Each pole —positive and negative—is, as shown, on a separate panel, whilst the neutral terminal block is separately affixed to one of the walls of the containing pit. For operation purposes—renewal of fuses or disconnection of a cable—the hinged street-leved lid E, from which the fuse panel is hung at point G, is raised to a vertical position on its hinge, and in doing so, the fuse panel is brought slightly above street level, and by virtue of the pivot at G maintains a vertical position. Further raising of the panel to a position wholly above street level is accomplished by revolving the screw F. Although the two charged panels are shown in the drawing back to back and close to one another, one pole may be much more removed from the other if desired. In fact, one

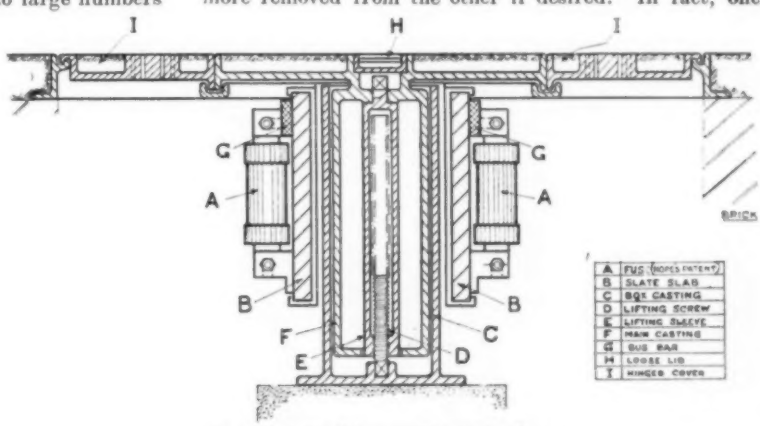


Fig. 2.—A 2,000-Ampere Distribution Box.

pole could be in one street and the other round the corner in another street, the neutral block being in either containing pit; or, if desired, the panels could be arranged face to face in the same containing pit without the brick division wall shown.

Fig. 2 shows a unit for distributing the same amount of energy as in the case of fig. 1, but here both charged panels and the neutral terminal block are mounted on a central support, so that if the lifting sleeve E is revolved at H, the whole mounting is raised above street level, bringing the fuse and terminal panels into a position above ground. The cubic space required for this design for

a d.c. unit is about equal to that required for the other design.

In both cases, the upward movement of the panels is permitted by the use of standard flexible cables connected between the tail-end box of the underground cable and the distributor terminal at the lower end of each fuse (or link). If the unit is also to be used as a feeder point, the feeder flexibles would be attached directly to the bus-bar shown in each case, and such feeder copper should perhaps be divided into two half section cables so that one half could be attached to each end of the bus-bar.

Supposing that the distribution is for a.c. circuits, then in the case of fig. 2, the third charged panel would be placed on the square central mounting opposite the neutral block, whilst in the swinging-panel design, a third containing pit would be required. It may be mentioned that the small street covers I in fig. 2 are suggested simply for the easy examination of the pits by the "box inspectors." The central cover rises with the electrical gear when the screw sleeve E is revolved.

The claims made for the new designs are: Simplicity; all the advantages of an overground pillar; no abnormal obstruction of the footpaths; entire freedom from short circuits; owing to the small depth of ground pit required, there is no necessity for drain to the sewer, as the gear would be well above the normal ground water level, the street-level frame being drained to the curb-edge; water troubles through condensation are non-existent because of the ease of ventilation and freedom from gas accumulation; their suitability generally for power distribution and for street lighting terminal boxes, for tramway and railway section dividers and feeder points, and for use in docks and all places where it is desirable to have unobstructed floors and gangways —designed on smaller lines, the gear can be adapted for wall or floor boxes in mills and like places; and the small space required for the distribution of comparatively large loads, thus cutting down the costs of installation.

It may interest readers to learn that application for the necessary letters patent for the new designs has been made.

Practical Experimental Work.

The Scientific Organisation of Procedure in Research.

By W. R. NEEDHAM.

IT is not every works which has an elaborately fitted research laboratory. Indeed, it is very few which have any laboratory at all, whether fitted elaborately or otherwise. At the same time, however, it would astonish many to know really how much experimental work is undertaken by small as well as large concerns. Such efforts may not be on any imposing scale, and yet may quite logically be classed as research work.

Most men with any experience worthy the name can recall times when something has gone wrong, and it has been up to them to worry out expedients or preferably discover remedies. In many instances this has involved days and days spent on the machinery itself, trying now one device, now another, until at last things have been so adjusted that normal functioning has been secured. This is no uncommon occurrence. Many men hate such a break as this occasions in the ordinary run of their work. Unless, however, it has all arisen by reason of some carelessness for which they are themselves responsible, they do far better to welcome these incidents as providing opportunity for finding out something very well worth while. In any case, very much depends upon the spirit or temper, and the mentality, of those who take matters in hand. The man who is all nerves and funks the whole job cannot in general be expected to succeed brilliantly. Of course, he may be a sticker, and fighting down his apprehensions really make good. Usually he isn't, and often his stage fright is not altogether unassociated with paucity in mental equipment for the task. Such chances may provide opportunity not available otherwise; they do offer scope in many instances for initiative and the garnering of valuable data. Where the results are other than expected, they are not necessarily on that account unimportant. As a matter of fact, what is dubbed a negative or dud result, may be far more instructive and useful than one in strict accordance with the experimenter's wish or preconception. In a very real sense there are no negative results. Once a man becomes at home in such work, he will be quite happy to observe what happens. He will then record what *does* happen. He will have overcome the novice's temptation (none the less real, because half involuntary) to jot down what he deems to be favourable and omit what he thinks otherwise. He will take care to make his notes impersonal, impartial. The true experimenter does not take sides. He is a reporter, not an advocate. Then afterwards he marshals his facts and deduces his laws, and is the better equipped to understand the real trend of things, to interpret the true meaning of the experiments he has undertaken. Thus, and thus only, can he hope to carry on and probe deeper. It may seem the longer way round. It is the truly scientific way. Often, even in apparently simple experiments, there is no short cut through. They who make a big splash sometimes do not get far. They may console themselves thinking they have won at a stroke, where others have failed at great length. Too frequently their remedies are hopeless quacks, and later the real doctor has to be called in.

It is obviously impossible to lay down hard and fast rules. Procedure varies to a large extent, according to circumstances. At the same time, however, there are certain broad and general considerations which are not unimportant. They assist one to get to grips. The more particular details are then all the more readily and logically attended to.

The present contribution closes with a brief discussion of these desiderata.

1. The person directly interested should either himself undertake and father the experiments, or else he should keep in close touch with the work.

It is always well to remember that however conscientious and painstaking a deputy may be, he cannot be expected, in the ordinary course of events, to understand fully the inwardness of things. Generally speaking, he will do what he is told to do, will work more or less closely to programme. But he will not carry out the whole in an altogether satisfactory manner. For him to do this, he needs instruction not merely in procedure, but more than anything else he needs to know what it is all about, and what it is for.

Thus if such work must be put in the hands of assistants, they should be given freedom of the facts; and the assistants chosen should be proven men, who can enter into the spirit of the enterprise. Good results cannot be expected unless the experimenter's interest is whetted and his zest awakened.

2. When determining the range and scope of tests, it is extremely advisable that careful thought be given to the subject. It should be studied from several angles. The kind of questions one asks one's self include:—

(*a*) What is it the experiments are to reveal?

(*b*) Is the problem one involving a few or many factors?

(*c*) How can one be reasonably sure the ground is really covered?

(*d*) What are the actual data sought?

(e) What readings and records are necessary? How many subsidiary details must be noted?

It is most annoying to find later that interpretation is obscured by reason of gaps in the records. A series of tests may have been taken, and the test sheets issued, and then it be found that certain highly important items have been overlooked during the tests. It is better to think beforehand than regret afterwards. In any case, the preliminary records should be in the hands of the responsible party before the apparatus has been dismantled. In this way, though the best may not have been secured, the worst may yet be avoided.

3. Having thought out the scheme, it should be translated into the black and white of definite instructions. A chart of procedure, carefully arranged, and fully informing, should be drawn up. It should embody the salient features and also the subsidiary particulars required.

Only the man really in the know is qualified to undertake this most necessary drafting of the plan of operations. He does well to supplement the written instruction with verbal explanation, preferably on the job itself. He cannot exonerate himself from blame unless he makes sure that those carrying out his orders really know what those orders are.

The more important the research is, the more necessary it is for him to nurse it well. His interest will stimulate that of those who assist him. Keen men become keen when they realise the importance of the work they do, and specially so when they truly grasp the hang of things. His frequent presence and keenness count for more than he probably realises.

4. As the experimental work proceeds, it is eminently desirable that one should keep constantly on the look-out for developments in the work itself.

Often enough it happens that results are being recorded which surprise the observer. They run counter to his predilections. It may thus be very advisable to modify one's original scheme in order to ensure that the real nature of the development be recorded. This in turn may suggest hopeful investigation along what would at first sight have appeared a side track.

This kind of experience has been fairly common to the workers in pure as distinct from applied science. Much of the success which has been won by these less trammelled pioneers has met them when they have turned aside to follow whither the trail has led.

It is essential that the experimenter be keen to observe just what happens, and as keen to trek where the scent draws him. The obstinate man, the prejudiced man, is useless in the pursuit of either pure or applied science; and experiments really have no meaning for him. His eyes are open for the phenomena which appear to support his theory; and he is blind to all else. In science and in its application to engineering, he is a drag, often a menace.

The writer is convinced he does well to urge these matters. He has several times been unable to reach a definite conclusion because tests which were supposed to be fully informing, omitted just the data which would have supplied the defect.

The plain fact is that often too little thought is given to the real object of the experiments; and thus only partial information is forthcoming. These things ought not to be. They need not be.

To mention one point only. Were adequate readings made, and records digested and analysed, how much more definite information we might have on the still somewhat obscure and very involved subject of lubrication. Tests are taken of all classes of commercial machines, many with oil ring bearings, many with flow lubrication. Exactly where is the zone of demarcation? It is not a wide zone. When is water cooling or oil cooling necessary? Usually we rely upon deductions from laboratory experiments carried out by eminent physicists on small bearings. Here, however, at the different works the very material is at hand. It ought to be readily possible to get a closer answer than needs must at present satisfy many engineers. Here surely is an excellent opportunity for putting theory to a fairly thorough test.

The Foundry Trades Exhibition.

Some Electrical Exhibits.

DUE no doubt to the present restricted train services, the number of exhibitors at the International Foundry and Allied Trades Exhibition, which was held at the Royal Agricultural Hall, London, N., from June 10th to 19th, was considerably short of what is usual. In spite of that, the exhibition was fairly well patronised, and the exhibits proved attractive, and a few of these were of interest to electrical people. The FOSTER INSTRUMENT Co. and the BOWEN INSTRUMENT Co. each had an interesting display of electrical pyrometers. The former company showed its new "Fixed Focus" radiator pyrometer, a "total radiation" type of instrument which is purely automatic in action. It is fitted with a patented removable window at the centre of the receiving tube to protect the sensitive part of the apparatus from damage by fumes and dust. The tube is also provided with ventilation openings, a diaphragm to prevent the entrance of stray radiation, and a special sighting device to facilitate accurate pointing. Among the other exhibits by this firm were the "Dial" recorder, which operates by producing a chain of dots by means of a carbon-paper sheet underneath a translucent circular chart; and a power-plant pyrometer, which has a concentric form of thermo-couple, in which the actual hot-junction is directly exposed to the temperature to be measured. Included in the range of pyrometric instruments by the Bowden Co. was a series of radiation instruments of which the "Pyro" was particularly interesting. In this instrument the radiation from the source of heat is received on a lens, which concentrates the radiant energy on a small thermocouple. A portable type of this instrument contains the optical system, the thermocouple, and the indicator complete in one unit weighing only 25 ounces and measuring 7 in. long by 4¼ in. in diameter The instrument is provided with a wooden carrying case and shoulder strap. For permanent installations the "Pyro Tube" is offered for connection by an external cable to either an indicator or a recorder, and a number of these tubes may be attached to the same instrument for multiple-station equipments.

Messrs. S. WOLF & Co., LTD., made a special display of electric tools, including drilling and grinding machines. A portable stone-grinding and polishing machine which was exhibited is the latest addition to this firm's products. The driving motor is mounted on a base (on wheels), which also carries an upright which supports the driving end of a flexible shaft; this is belt-driven from the motor. The flexible shaft enables a wide range of work to be done, including moulding, sawing, bevelling, and polishing. A water tank is mounted at the head of the upright, a suitable tube from this enabling wet grinding to be done.

Among a selection of air compressors shown by Messrs. BROOM & WADE, LTD., was a 2-cylinder "Broomwade" directly coupled to and mounted on a common bedplate with a 25-h.p. driving motor. This machine will give an output of 130 cu. ft. of free air per min. at 100 lb. per sq. in.

Some interesting magnetic separating machines were seen on the stand of the RAPID MAGNETTING MACHINE Co., LTD. A patent combined sand sifter and magnetic separator was employed on the regeneration of used moulders' sand. The working part of the machine is a slightly-tilted horizontal revolving drum through which the mixture travels. The upper and major portion of the drum is a sieve, which discharges the pure sand; the splashings, &c., are attracted to the magnetising end at the bottom of the drum.

A portable electric sand riddle was exhibited by Messrs. JOHN MACDONALD & Co. This machine carries the sieve on a projecting arm and operates it in an elliptical motion with the necessary "kick" required in such a machine. The ¼-h.p. driving motor and the crank gearing are entirely enclosed and thoroughly protected from the sand. The whole is mounted on three legs, one supplied with a roller, enabling the machine to be moved about as with a wheelbarrow.

Messrs. JAMES KEITH & BLACKMAN Co., LTD., showed a newly-designed dust and grit separator for the removal of grit from flue gases. In this device the separator and fan are arranged as a single unit.

The TURBINE FURNACE Co., LTD., exhibited the "Vulcan" boiler tube and flue cleaner. It is steam operated and is equipped with up to 5 or 6 parts for the steam outlets to the required parts of the boiler. The ports are governed so that only one is open at a time, the last port being automatically closed as the next one is opened.

A special non-commercial and technical portion of the exhibition was organised to show something of the research carried on in the industry (foundry), its history, apparatus available for the scientific control of processes, and a survey of some of the raw materials used. A number of special furnaces were seen on the stand of the NATIONAL PHYSICAL LABORATORY, including a high-frequency induction furnace suitable for 20-lb. melts of iron or copper alloys. The Research Department, Woolwich, showed some of the applications of X-rays for the examination of metal castings and forgings. By means of one set of equipment it is possible to take a radiograph through over 4 in. of steel and to reveal an internal hole of ¼ in. diameter in the centre of the specimen. The Universities of Sheffield and Birmingham, the British Non-Ferrous Metals Research Association, and the British Cast-Iron Research Association also exhibited.

D

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

The "Electrical Review" Index.—The Index to Vol. XCVIII (for the half-year ending June 30th, 1926) will be published shortly, and we shall be glad to receive the names and addresses of those who require it (free of charge) for binding purposes or wish to retain it for reference. Application should be made at once to the Publisher, 4, Ludgate Hill, E.C.

Company Law Amendment.—A lecture traversing the report of the Company Law Amendment Committee was given on June 16th by Mr. Herbert W. Jordan, under the auspices of the Incorporated Secretaries' Association, to members of that body and representatives of the banking and accountancy professions.

Trade with Newfoundland.—In a report to the Department of Overseas Trade (Stationery Office, 2s. 3d. net) Mr. F. W. Field, Senior Trade Commissioner in Canada and Newfoundland, states that the colony's trade is in a position which indicates that an improvement might be made so far as the United Kingdom is concerned. In 1923-24 the total imports of Newfoundland were valued at $27,677,182; of this Canada supplied $11,569,434, the United States $8,589,290, and the United Kingdom $6,250,360. In the succeeding year, however, of a total of $36,404,674, Canada's share was $13,759,788, that of Great Britain $11,357,585, and that of the United States $9,976,292. The merchant firms of St. John's are an important factor in import trade. The people of Newfoundland do not approve of the appointment by British firms of agents in Canada to attend to business in Newfoundland.

Newfoundland Tariff Changes.—The *Board of Trade Journal* publishes a list of alterations in the Newfoundland customs tariff which took effect on May 19th last. Among the goods affected are steam engines, i.c. engines, electric generators and motors, air compressors and steam boilers for use in connection with mining machinery, which are to be admitted free of duty; radio "machines" and apparatus which are subject to an *ad valorem* impost of 50 per cent.; and welding outfits which will pay 35 per cent. *ad valorem*.

The Registration of Contractors.—At the last meeting of the Executive Committee of the National Register of Installation Contractors the following were accepted, while 11 applications were refused and one was withdrawn:—

Carwin Electrical Co., Preston
Mulligan Bros., Dublin
Webb & Co., Birmingham
Spouge, C. R., Lincoln
Rayton, S., & Co., Leeds
Patterson, R. H., Jesmond, Newcastle-on-Tyne
Brightside Foundry & Engineering Co., Ltd., Birmingham
McCall, W. A., Blackburn
Milner, E. H., High Wycombe
Teesdale & Jones, Swindon
Carr, Harold, Leeds
Davidson, Taylor & Co., Sunderland
Smerdon, T. H., N.W.5
Parker, Winder & Achurch, Ltd., Birmingham
Birch & Evans, Walsall
Cross, G. & A. J., Tunbridge Wells
Brady, G., & Co., Manchester
Sigsworth, A. B., & Co., South Shields
Saunders, H., & Son, Horsham
Fletcher & Thurley, Manchester
Warburton, W., & Co., Ltd., Halifax
Smith, W., & Son, Weymouth
Dudley, C., & Co., Blyth
Kent, F., Clonmel, Tipperary
Phillips, H. S., Weston-super-Mare
Riddels, Ltd., Belfast
Stoves, L., South Shields
Thomas, A. J., Newton Abbot
York Corporation Electricity Department
Beckenham Urban District Council Electricity Department

Telephone Apparatus Contracts.—The STERLING TELEPHONE AND ELECTRIC CO., LTD., informs us that it has recently received a number of important overseas contracts, including one valued at about £80,000 from the Commonwealth of Australia for telephone switchboards, one for switchboards from the Union of South Africa, and another for wall and pedestal telephones and switchboards from Argentina.

Swedish Electrical Exports.—The *Swedish Economic Review* (the official organ of the Swedish Board of Trade) states that during the first four months of the current year electrical machines to the value of 8,277,000 kr. and telegraph and telephone apparatus valued at 1,650,000 kr. were exported from Sweden. In the corresponding period of 1925 the figures were 4,700,000 kr. and 1,962,000 kr. respectively.

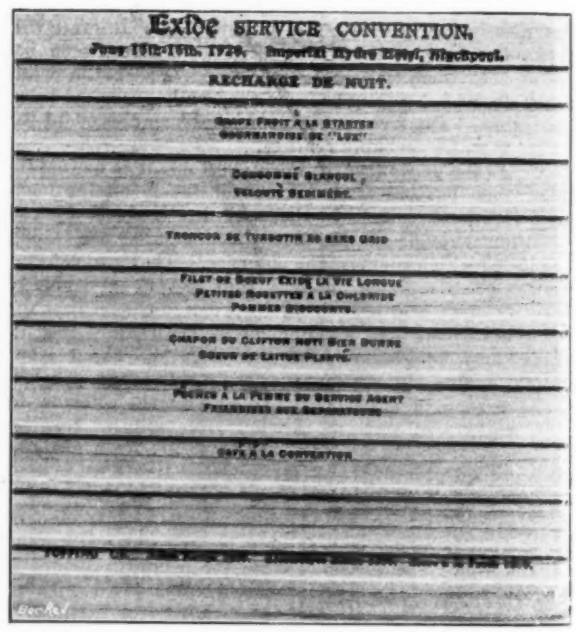
Difficulties of the Swedish Market.—In the course of a report on this subject a representative of the Federation of British Industries says that British manufacturers endeavouring to obtain a footing in the Swedish market should class Sweden as a manufacturing country. In all engineering matters Sweden plays a leading part and has an established position in this industry. It is true that certain lines of British products will always find a sale, but, generally speaking, Sweden is determined to manufacture as much and import as little as she can, and in this policy she has the assistance of a protective tariff on goods which can be manufactured locally. A country where the currency has remained steady for several years has obvious attractions for the foreign exporter, and it is probably a fact that Sweden, in comparison with the extent of her purchasing power, has had more offers of foreign agencies than any country in Europe.

Household Appliances.—A Household Appliances Section of the London Chamber of Commerce is being formed. At a luncheon to be held at the Holborn Restaurant on Monday, July 12th, Mr. F. W. Goodenough will deliver an address on "The Advantages of Co-operation in the Household Appliances Industry."

Adhesive Tape.—MESSRS. A. H. HUNT, LTD., have sent us three samples of their adhesive insulating tape. Two of the samples are in tins of different sizes; the third is wrapped in tinfoil. The tape is supplied in attractive cartons in four colours for counter displays.

Foreign Orders for Germany.—The *Deutsche Bergwerks Zeitung* learns from Helsingfors that as a result of the public adjudication for the supply of electrical cables and insulators to be used in the construction of the largest water power works in Eastern Europe, on the Imatra waterfall, the Finnish State Water Power Commission has placed large orders with the German electro-technical industry. The German telephone works have received fairly large orders for telephones, and contracts for the supply of insulators and cables have been signed with the Brown, Boveri Company, the Gutehoffnungshütte A.G. and the Hermsdorf-Schomburg Isolatoren G.m.b.H.—*Reuter's Trade Service* (Essen).

An "Exide" Convention.—Last week the annual convention of "Exide" battery service agents was held at Blackpool, when there was an attendance of about 200. The meetings were held in the large ballroom of the Imperial Hydro and the subjects discussed included developments of new designs, regulations affecting battery workshops, new and improved methods of charging batteries, &c. It is claimed by the Chloride Electrical Storage Co., Ltd., that these conventions prove of real value to a great proportion of the general public. The annual dinner was held on June 15th. A novel and apposite menu was provided, printed on wood separators. One of these is depicted herewith.



A Novel "Exide" Menu Card.

Employment during May.—Employment in the engineering industry during May was very bad, being seriously affected by the general strike and the coal stoppage. The general average of unemployment throughout the industry rose from 10.4 per cent. in April to 15.8 per cent. The electrical engineering branch was badly hit, the figure in this case rising from 6.6 to 10.6 per cent. The electrical wiring and contracting industry showed an unemployment figure of 10.3 per cent., as compared with 9.1 per cent. in April, although the figure was better than in May, 1924, when it was 13.8 per cent. The percentage of unemployed in the electrical cable, wire, and electric lamp manufacturing group rose from 6.5 to 9.6.

Lead.—Reporting on June 19th, Messrs. James Forster and Co. stated: "Consumers in this country, owing to the importation of large quantities of foreign coal, are now obtaining their full supplies of fuel, and are therefore consuming lead at the normal rate, the Home trade being particularly busy. Arrivals, on the other hand, so far this month are on the short side, the deficiency being made up by deliveries of warehouse lead. The present position of lead seems to us to be fundamentally sound, and we do not expect to see the present reaction carried very far, but look for higher prices again in the near future." The Board of Trade returns for May show:—Imports, 18,752 tons; exports, 1,005 tons, leaving for Home consumption 17,747 tons.

Irish Free State Electrical Imports.—The Irish Free State Ministry of Industry and Commerce has issued detailed figures of imports for last year as compared with 1924. From these we have compiled the appended table, showing the value of the total imports of electrical machinery and apparatus into the Free State and the amount attributed to the United Kingdom as country of shipment but not necessarily of manufacture:—

	Total.		U.K. Share.	
	1925.	1924.	1925.	1924.
	£	£	£	£
Electric wires & cables	123,620	78,416	92,367	62,619
Telegraph and telephone instruments and apparatus	28,961	28,531	27,909	28,405
Electric lamps and parts	58,917	61,913	56,878	59,221
Batteries and accumulators	36,418	32,839	34,048	29,860
Radio sets and parts ...	84,966	93,753	83,225	91,414
Other electrical goods and apparatus ...	70,703	98,535	67,355	94,412
Electric generators ...	18,042	13,313	13,822	12,265
Electric motors	23,465	17,330	22,811	16,585
Other electrical machinery	73,873	65,917	63,261	51,777
Totals ...	£518,965	£490,547	£461,676	£446,559

It will be seen that while wide variations are shown in the different classes of goods, the 1925 imports show an increase of £28,418 as compared with those of the preceding year. All but £57,289 of the goods came from the United Kingdom and of the balance £38,901 is attributed to Germany, £8,334 to Belgium, £5 to Switzerland—the last being a drop from £12,762 in 1924—and £9,049 to "other countries."

Japanese Developments.—*Commerce Reports* states that the over-development of electric power enterprises has caused a surplus of power. In consequence, business in electrical power-plant equipment is expected to slow up for about a year. In the meantime the power companies are promoting sales and encouraging the use of consuming devices for domestic and other purposes.

Trade Announcements.—MESSRS. MAXTED & KNOTT, LTD., have closed their offices at Dunstable and Queen Anne's Gate. Their new address is 82, Victoria Street, S.W.1. Telephone: Victoria 0529; telegraphic address: "Rightfully, Sowest, London."

The address of TRACTOR TRADERS, LTD., is now: Thornycroft House, Smith Square, S.W.1. Telephone: Victoria 7609; telegrams: "Tracenergy-Parl, London."

The S. H. COLLETT MANUFACTURING CO. has moved to 60, Pentonville Road, N.1. Telephone No.: North 0791.

As an impression is abroad that recent financial difficulties would necessitate the closing down of FULLER'S UNITED ELECTRIC WORKS, at Chadwell Heath, we are asked to state that the business is being carried on as usual under the control of Sir John Mann, as receiver and manager.

Owing to the expansion of their London business, MESSRS. HIGGS MOTORS have taken larger offices. Their London address is now 170, Strand, W.C.2.

Catalogues and Lists.—THE BLACKADDA RADIO CO., LTD., 48, Sadler Gate, Derby.—A booklet (price 1s.) containing details of the company's system of building various types of radio receiving sets from standard parts.

SIEMENS & ENGLISH ELECTRIC LAMP CO., LTD., 38-39, Upper Thames Street, E.C.4.—Catalogue No. 150, containing illustrations and prices of wall brackets, lanterns, electroliers, pendants, and other electric lighting fittings.

BRITISH CENTRAL ELECTRICAL CO., LTD., 6-8, Rosebery Avenue, E.C.1.—A catalogue (124 pp.) of industrial lighting fittings, conduit and fittings, cables, switchgear, instruments, &c. Fully illustrated and priced.

THE MARCONIPHONE CO., LTD., 210-212, Tottenham Court Road, W.1.—A well-illustrated price list of "Marconiphone" and "Sterling" radio receivers, accessories, and components.

MESSRS. PRIESTLEY & FORD, 3, Carr's Lane, Birmingham.—A comprehensive catalogue of radio apparatus and a pamphlet dealing with "Pye" receiving sets and components. Illustrated and priced.

BRITTAIN'S ELECTRIC MOTOR CO., 110, Cannon Street, E.C.4.—Illustrated pamphlets advertising the firm's single- and polyphase motors.

MARCONI'S WIRELESS TELEGRAPH CO., LTD., Marconi House, Strand, W.C.2.—Leaflet No. 1,056, containing an illustrated description of the Marconi recording receiver.

THE FALKIRK IRON CO., LTD., Falkirk, Scotland.—Publication No. 487, dealing with the method of cooking employing the "Falco" "inducer."

THE J. K. W. MANUFACTURING CO., 1 and 2, Bridge Street, Middlesbrough.—An illustrated pamphlet giving details and prices of "J. K. W." solid-contact lampholders.

THE IRON & NICKEL BATTERY CO., LTD., 17-19, Cockspur Street, S.W.1.—A descriptive pamphlet dealing with the company's "Ionic" nickel-iron accumulators.

MESSRS. J. H. TUCKER & CO., LTD., King's Road, Tyseley, Birmingham.—Leaflet No. 200, advertising the company's "Telac" 15-A plugs and sockets. Priced.

THE GLOBE ENGINEERING CO., LTD., Brighouse.—List No. 14, containing particulars of the company's battery-charging motor-generators and auxiliary equipment.

MR. J. R. MORRIS, Imperial House, 15-19, Kingsway, W.C.2.—A booklet containing hints on the choice of radio batteries and advertising "Columbia" products; with useful technical data.

THE VACUUM OIL CO., LTD., Caxton House, Westminster, S.W.1.—No. 24 of the "Gargoyle" Technical Series dealing with the lubrication of horizontal steam turbines for stationary plant.

MESSRS. E. P. ALLAM & CO., LTD., 107-109, Gray's Inn Road, W.C.1.—A stock list of d.c. motors, &c.

THE ENGLISH ELECTRIC CO., LTD., Queen's House, Kingsway, W.C.2.—Publication No. 768, containing an illustrated description of plate mill equipment installed at the Consett Iron Co.'s works.

MR. PAUL DIENY, 21, Laurence Pountney Lane, E.C.4.—A pamphlet advertising a crushing, mixing and separating mill for foundries.

Bankruptcy Proceedings.—J. M. LONGE, 1, Queen's Gardens, Lancaster Gate, W.—The public examination of this debtor, who formerly traded as an electric lamp manufacturer, was held on June 18th, before Mr. Registrar Francke, at the London Bankruptcy Court. He failed in April last with liabilities of £8,866 and assets "cash in hands of solicitor," £185. The debtor said that in July, 1920, he commenced and afterwards carried on business in partnership with two persons named Edgehill and Shear, as manufacturers of electric lamps under the style of "The Eclat Electric Lamp Company." He took no part in running the business, but only provided money; he paid £1,800 for a one-third share of the business and in addition advanced over £2,000 for its purposes. During 1921 he commenced proceedings for a dissolution of the partnership and in December of that year a Receiver was appointed to wind up its affairs. Witness experienced some difficulty in getting matters settled and, in fact, they were not all wound up yet. He personally discharged the liabilities of the partnership, although his partners were equally liable and he was of opinion that they owed him about £5,000. He had not returned them as book debtors, because he did not know their present whereabouts, and he was unable to recover anything. His total loss over the partnership was about £7,000. In January, 1923, witness purchased for £8,000 the Spencer Lamp Works and the Standard Lamp Works at Wimbledon, and during the next six months carried on those businesses under management. He gave bills for £2,000 on account of the purchase price, which were duly met, and the remaining £6,000 was left on mortgage. Miss Stewart, a creditor for £4,350, guaranteed advances by the bankers for the purpose of that business and also of buying a farm. In July, 1923, witness registered "The Eclat Electric Manufacturing Co., Ltd.," with a nominal capital of £500, which acquired the Wimbledon businesses and as consideration he was allotted £13,500 second mortgage debentures. First mortgage debentures were given in respect of the mortgage, and debtor was appointed one of the directors. In June, 1924, the company obtained a loan of £11,000, from the Westminster Bank, and he guaranteed the repayment of the loan. The petitioning creditor signed a guarantee to the amount of £3,500, and witness gave a guarantee for the same amount. He (debtor) also deposited with the bank, as security for the loan, shares in various trading concerns to the value of £9,000. A debenture holders' receiver was appointed on February 14th, 1925, because although the company was doing fairly well, the debenture interest had not been paid. Towards the end of 1925 the petitioning creditor called upon witness to discharge his guarantee; he could only do so to the extent of £300 and bankruptcy proceedings were instituted. The Bank sold off the securities which he had deposited, and all his other assets, including some valuable furniture, had been disposed of. In September, 1923, witness registered another company called "The Eclat Electrical Accessories (Paddington) Company, Ltd.," with a nominal capital of £1,000, to carry on business as dealers in electrical accessories. He acted as a director, but the company was not a success and he did not know anything regarding its present condition. The debtor attributed his insolvency to the failure of the two before-mentioned companies and to his liability under the guarantee for £3,500, for which he received no consideration. Apart from that guarantee he estimated his loss over the companies at £5,500. The examination was concluded.

C. J. NICHOLS, trading as C. J. Nichols & Co., 7, Park Street, Bridgend, Glam., electrical engineer.—The adjourned public examination of this debtor was held recently at the County Court, Bridgend. The deficiency was estimated at £1,308. Debtor stated that he had lost money on contracts through unforeseen events. It was stated that one of the trustees had died, and it was necessary to appoint a new one. The examination was adjourned.

E. H. TANSEY, wireless dealer, 65, Factory Road, Hinckley.—Receiving order made June 12th, on debtor's own petition. First meeting, June 25th, at the Official Receiver's offices, 1, Berridge Street, Leicester. Public examination, July 2nd, at the Castle, Leicester.

C. W. WILSON, electrical engineer, Wepre, Higher West Cross Lane, Swansea.—Receiving order made June 16th, on creditor's petition.

S. C. RAPSON, C. L. BURRILL and A. J. HEFFER (Suburban Electrical and Maintenance Co.), electricians, 2, Plough Yard, Shoreditch.—Last day for proofs for dividend, July 2nd. Trustee, Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C.

J. H. PAINTER (Venables & Co.), electrician, 99, The Broadway, Cricklewood, N.W.—First and final dividend of 1s. 1d. in the £, payable at the offices of Corfield & Cripwell, Balfour House, Finsbury Pavement, E.C.

R. C. J. WARNER and S. R. PEARCEY (Warner & Co.), electrical and radio engineers, 28, Hill Street, Poole.—Receiving order made June 10th, on debtors' own petition.

A. E. S. CHALLENER, radio engineer, 277, St. Sepulchre Gate, Doncaster.—First meeting, June 23rd, at the Official Receiver's offices, Figtree Lane, Sheffield. Public examination, July 1st, at the County Court Hall, Sheffield.

J. R. BARKER, wireless dealer, Tanshelf House, Front Street, and Gillygate, Pontefract.—Last day for proofs for dividend, June 30th. Trustee, Mr. B. S. Briggs, 21, King Street, Wakefield.

Company Liquidations.—REFLEX RADIO CO., LTD., 198, Lower Clapton Road, Clapton.—The first meetings of creditors and shareholders were held on June 14th at Carey Street, W.C. Mr. J. Barwick Thompson, Official Receiver, reported that the winding up order was made on May 11th, 1926, upon the petition of Watson & Jones, Ltd., creditors for £191. The company was formed in September, 1925, with a nominal capital of £1,000, to acquire as a going concern the business of wholesale factors of radio components, carried on under the style of Reflex Radio Company. The business had been carried on by A. T Izzard and R. E. Izzard (who were the first directors), since October, 1923. The company agreed to pay for the business £1,150, to be satisfied by the issue of a debenture for £1,000 and £150 in shares. The directors had stated that the business was carried on successfully until January, 1926, when the demand for the "Reflex" coil, of which the company had obtained the sole selling rights, considerably decreased owing to the competition of a similar coil and this resulted in the company trading at a loss On March 18th, 1925, owing to the debenture interest being in arrear, and also to the fact that creditors were pressing for payment, the debenture holders appointed Mr. F. Davies, as receiver and manager. That gentleman carried on the business until May 27th, 1926, and had realised most of the stock and book debts. He had paid off the debentures and handed to the Official Receiver a balance, with the result that, assuming the other book debts realised anything like the value placed upon them, there would be assets to the amount of £385, to meet the unsecured claims of £1,710. The failure of the company was attributed to excessive competition, heavy cost of advertising, and delay in the delivery of coil plugs at a time when there was a considerable demand. In the opinion of the Official Receiver, however, the failure was due to mismanagement and excessive expenditure. Considerable discussion ensued respecting offers sent out by the debenture holders' receiver to purchase the unsecured claims at 1s. and 3s. in the £ respectively, and eventually the chairman, in whose hands the liquidation was left, said it might be his duty to report the facts to the Court.

RADIO EQUIPMENT CO., LTD., 5, Dyer's Buildings, Holborn, E.C.—Under a compulsory winding up order made against this company last March on the petition of a creditor, Mr. G. D. Pepys, Official Receiver, reports that accounts have been lodged showing unsecured debts of £5,575; preferential claims, £37; loans on debts, £980; assets valued at £314; and a deficiency of £6,273 to the shareholders, the issued capital being two ordinary shares of £1 each. The company was formed as a private company in July, 1922, with a nominal capital of £100, to carry on business as manufacturers of and dealers in radio equipment. The promoter of the company was P. J. White, who states that he formed the company primarily for the purpose of acting as the selling agents for the manufactures of John Hall & Co., Birmingham. The directors at the date of the winding up order were the promoter and G. F. Ostins, the proprietor of John Hall & Co., who each held one of the only two shares issued by the company. In November, 1922, the company entered into an agreement with Ostins, under which it was given for a term of five years the exclusive selling agency of the "wireless accessories" output of John Hall and Company, and a considerable part of its trading has consisted in conducting this agency. The company also opened small "assembling" depôts at Stratford and Birmingham, at which receiving sets were manufactured and placed on the market as its own products. These depots, however, had to be discontinued owing to lack of capital, and in October, 1923, the directors formed Radio Works, Ltd., and to this company was transferred the goodwill, plant, stock-in-trade, &c., of the Birmingham depôt. No independent valuation of the depôt appears to have been made, and the Official Receiver states that he will require to be satisfied that the amounts apportioned were the true values and estimates or approximately so. Radio Works, Ltd., went into voluntary liquidation in February, 1926, and by its liquidator (who is also the liquidator of Radio Equipment Co., Ltd.), is claiming to be a creditor for goods supplied to the company. A debenture securing £980 was given by the company to Lighting, Heating and Glass, Ltd., but having been made within three months of the commencement of the winding-up it could not be a valid charge for more than £558, representing the value of goods supplied. The failure and insolvency of the company is attributed by White to foreign competition and insufficient capital. In the opinion of the Official Receiver, the rate of remuneration drawn by White and L. C. Russell (who acted as a director for a time) has substantially increased the financial strain and contributed to the failure of the company. On April 22nd, 1926, the debenture holder appointed Mr. C. Latham as receiver and the Official Receiver has handed to that gentleman the small amount which he has so far collected from the book debts and certain of the books. Mr. R. L. Taylor, I.A., Coventry House, South Place, E.C., has been appointed liquidator, with a committee of inspection.

SOUTHERN RADIO SUPPLIES, LTD., Junction Road, Eastbourne.—A meeting of creditors was held recently at the offices of Messrs. Edmonds, Clover & Jones, Eastbourne, when the chair was taken by Mr. P. M. Jones, who stated that he had been appointed to act as the liquidator in the voluntary liquidation of the company. A statement of affairs was presented, which disclosed liabilities of £470 and assets amounting to £312, leaving a deficiency of £158. The issued share capital of the company amounted to £300, so that there was a total deficiency of £458. The position of the company was attributed to insufficient capital and losses on trading. It was decided that the voluntary liquidation of the company should be continued with the present liquidator.

ANDERSON, ANDERSON & ANDERSON.—At a special meeting on June 11th, it was decided to amalgamate the business of the company with Anderson's Bristol Rubber Co., Ltd., W. McKee and Co., Ltd., and Geo. Cording, Ltd., and with that view to wind up the company voluntarily and appoint Mr. G. Wilkins, of 52, Coleman Street, E.C., liquidator, with powers to consent to the registration of a new company under the name of Anderson's Rubber Co., Ltd.

NELSON ELECTRIC CO., LTD.—The petition of Eugene Durand and Co., of India Street, Crutched Friars, E.C., for an order for the compulsory liquidation of this company, was dismissed by Mr. Justice Romer in the Companies' Winding-Up Court on June 22nd. Counsel for petitioners said that they had been paid in full, and he asked for the petition to be dismissed.

BRITISH BARIMAR-THERMIT WELDING CO., LTD.—Winding up voluntarily. Liquidator, Mr. F. Rowland, 3, Thames House, Queen Street Place, E.C.

CAR LIGHTING & IGNITION CO., LTD.—Winding up voluntarily. Liquidator, Mr. E. R. Bradley, 584, Christchurch Road, Boscombe.

TRENT BRIDGE RADIO CO., LTD.—A meeting of creditors was held on June 22nd at 44, Parliament Street, Nottingham.

Private Arrangements.—COMTON WIRELESS MANUFACTURING CO., 26-28, Bartholomew Square, Old Street, E.C.1.—The creditors interested herein were called together on June 14th, at the above address, when the chair was taken by Mr. P. Houston, of Messrs. Corfield & Cripwell. No statement of affairs was presented but Mr. J. Mortimer, accountant, stated that the debtors had executed a deed of assignment to him for the protection of the assets that day. He had been consulted some two months earlier with a view to obtaining capital owing to creditors pressing. He read a balance sheet for the nine months ended December 31st, 1925, which showed trade creditors at £2,496, and a bank overdraft of £161. A Mr. Freeman was a cash creditor for £250 and there were sundry creditors for £232. The assets were valued at £3,907. A further balance sheet as at May 31st last showed that the trade creditors amounted to £2,508; the bank's claim was £136; Mr. Freeman was a cash creditor for £81 and there were sundry creditors amounting to £479. The assets were smaller. Several creditors held stock as security for their debts. There were three partners in the business. Two creditors had levied execution and a sale had been advertised by the sheriff for the following day. It was decided that the meeting should be adjourned for a week. The following are creditors:—

	£		£
Ebonestos Insulators, Ltd. ...	102	Robinson & Sons, Ltd.	52
Davis & Timmins, Ltd. ...	167	Barrel Polishing & Plating Works	22
Spears & Co.	88	Weber & Fluck (Switzerland) ...	107
Fahr & Co. (Switzerland) ...	340	Franklin, T. H., & Co.	171
Creasey, Geo., & Sons	23	Smith & Sons	120
Lowenadler, F. W.	540	Trader Publishing Co., Ltd. ...	53
Barnard & Crannis, Ltd. ...	40	Bankers	136
Crystalate Mfg. Co.	122	Scadding & Bodkin	53
Franklin & Freeman	405	Samuels, A. E., & Co.	249
B.D. & Co. (E. A. Boynton), Ltd.	68	Freeman, A.	81

A. & M. HAMILTON, LTD., 148, Fenchurch Street, and London Street, E.C., radio and cycle dealers.—A meeting of creditors was held on June 14th at the offices of Messrs. De Meza and Menasse, solicitors, Bishopsgate, E.C., when Mr. De Meza reported that the liabilities to trade creditors amounted to £650 and there was an amount of £725 due in respect of the rent of the two premises. The assets were valued at £700. An overdraft at the bank for £80 had been guaranteed. There were no cash creditors. The company was formed about twelve months ago with a nominal capital of £1,000, of which 400 shares had been taken up, 200 shares being given in part payment for stock. He was unable to get figures relating to the trading, but said that the present position had been brought about chiefly by the very high rents which were paid and insufficient profit. An offer was made of a composition of 5s. in the £, payable by monthly instalments and guaranteed. That offer was subsequently increased to 6s. 8d. in the £. Several creditors intimated that they would be willing to accept the offer, and it was decided that a committee of inspection should be appointed.

Dissolutions of Partnership.—HOOPEL & FARMBOROUGH, automobile and electrical engineers, 7, Loveridge Road, Brondesbury, N.W.—Messrs. F. C. Hoopel, A. E. Farmborough and W. T. Sharpe has dissolved partnership. Mr. Farmborough will attend to debts.

DASH WIRELESS SERVICE, dealers in wireless apparatus, 241, Park Road, Aston, Birmingham.—Mr. H. A. Burton and Mr. A. H. Onions have dissolved partnership.

DENNIS & JAMES, electrical engineers, Triumph House, 189, Regent Street, W.1.—Mr. R. Weaver and Mr. R. A. J. Brett have dissolved partnership. Mr. Weaver will attend to debts and continue the business under the same style.

Book Notices.—We have received a copy of the Glasgow Convention number of the *Electrical Age for Women* (6d.), the organ of the Electrical Association for Women. We cordially welcome our new contemporary and congratulate the editress, Miss Haslett, on the interesting appearance of this the first quarterly issue. Greetings received from many sources are published, also notes respecting E.A.W. activities, and a number of articles on such subjects as how electricity is made; light for the modern home; electrical refrigeration of food; electric cooking, &c.

"The Priestman-Atkinson System of Co-operative Production." (7 pp. and 4 diagrams.) London: Henry Atkinson and Co.—This pamphlet is one of a series (No. 5) in which is set forth a profit-sharing scheme involving the payment of a collective bonus on the increase of a whole workshop above a certain standard. It is claimed that this method eliminates the disadvantages of both day rates and piece rates.

"Science Abstracts" (A and B). Vol. XXIX, Part 5, May 25th, 1926. London: E. & F. N. Spon, Ltd. Price 3s. each.

"*Journal* of the Institution of Electrical Engineers." Vol. LXIV, June, 1926, No. 354. London: E. & F. N. Spon, Ltd. Price 10s. 6d.

"Elements of Alternating Currents and Alternating Current Apparatus," by J. L. Beaver. Pp. viii + 370; figs. 301. London: Longmans, Green & Co. Price 18s. net.

"Modern Telpherage and Ropeways," by H. Blyth. Pp. xv + 156; figs. 127. London: Ernest Benn, Ltd. Price, 27s. 6d. net.

"*Journal* of the American Institute of Electrical Engineers." Vol. XLX, No. 6. June, 1926. New York: The Institute. Price $1.

The Summer Number of *Punch*, which has this week made its appearance (1s.) is quite up to the usual standard of excellence in respect of both humour and illustrations.

"Coal- and Ash-Handling Plant," by J. D. Troup. Pp. viii+148; illustrated. London: Chapman & Hall, Ltd. Price 13s. 6d. net.

The Timber Trade.—Our Timber Trade correspondent reports that the troubles in the coal industry have retarded the long overdue improved demand for soft timber for general and building purposes. Imports, however, were much lighter last month, and have been much lower this year compared with the early months of 1925. Consumption is fairly good, and stocks on the market, although ample, are not too large, especially in view of the much larger demand expected when trade generally resumes. Prices are steady. In the hardwood trade, imports have shown a decline; stocks, however, are still large and the demand dull, but merchants are anticipating much better inquiries from general consumers when trade is once more set going. Mahogany of the poorer qualities is obtainable at reasonable rates, as are also British and American woods. The better qualities of all descriptions, however, continue to be firm in value.

Industrial Relations.—The annual general meeting of the National Industrial Alliance, originally arranged for May 11th but postponed owing to the general strike, has been fixed for Wednesday, June 30th, at Gatti's, London. At a luncheon meeting at 1 o'clock speeches are to be delivered by the Rt. Hon. J. H. Thomas, Colonel F. Vernon Willey, Mr. Charles Sitch, M.P., and Mr. W. L. Hichens. The speeches, together with that of the chairman, Sir Edward Manville, are to be broadcast. Trade union and employer delegates from some sixty centres are to attend the meetings.

Big Turbo-Generator Contract.—MESSRS. BRITISH BROWN, BOVERI, LTD., inform us that the American Brown-Boveri Electric Corporation has just obtained an order from the United Electric Light & Power Co., New York, for a turbo-generator designed for a continuous output of 160,000 kW, to be installed in the Hellgate power station. This plant is about three times as large as the biggest turbo-generator set yet built and put into operation. We understand that the business was secured against the keenest American competition. The reason for a set of this size being ordered is to be found in the great value of floor space in and around New York. Plant of the greatest possible capacity has to be got into the space still available in this power station, amounting to 67 ft. by 39 ft. The set now on order will be of the cross compound type, *viz.*, one high-pressure cylinder at 1,800 r.p.m., and one double-ended low-pressure cylinder at 1,200 r.p.m., driving respectively generators of 75,000 kW and 85,000 kW, wound for 13,800 volts.

American Competition in Chile.—The Valparaiso correspondent of the Federation of British Industries reports that in Chile prices generally seem to be higher and steadier again, and competitive price-cutting would appear to have become less prevalent. United States prices, however, now seem lower than they have been for some time, and on a recent quotation for electrical goods, British firms were under-quoted by 10 per cent. on the actual cost of the goods, without taking into consideration commission of any kind.

The National Radio Exhibition.—The National Association of Radio Manufacturers and Traders informs us that an erroneous impression is abroad that this exhibition, which is to be held at Olympia in September, is being organised solely by that body. Such an impression could not have been gained by our readers as we made it clear in our recent note and leaderette on the subject that the Society of Radio Manufacturers was associated with the N.A.R.M.A.T. in the promotion of the show.

Social Events.—The Peterborough and District Electricity Users' Association recently gave a dinner to the volunteers and staff who maintained the supply from the Corporation's power station during the general strike.

An informal golf match was played on June 6th between golfing members of the directorates and staffs of the Automatic Telephone Mfg. Co., Ltd., and Peel-Conner Telephone Works, on the latter's course. In the singles, comprising 18 contests, the A.T.M. secured 9½ points and their opponents 8½ points. In the foursomes the Peel-Conner representatives made the best showing (4½ points to 3½); a notable victory was secured by Sir Alexander Roger and Mr. E. A. Mellinger over Sir Wm. Noble and Mr. W. Cook.

The fourth annual sports and gala of Siemens Sports Club took place on the club's sports ground, Charlton, on June 19th. The weather was excellent and the heavy programme of fifty-five events was carried through well to time without a single hitch. Callender's Prize Band played throughout the afternoon, and in addition to the actual racing, jumping, &c., there were numerous side shows and the children were not forgotten. The attendance at the sports amounted to about 5,000. Sir Walter R. Lawrence, Bt., a vice-president of the club, presented the prizes.

Coal Shortage.—It is reported that the Stanton-Holwell and Riddings works of the Stanton Ironworks Co., Ltd., are closing this week-end owing to lack of coal. About 7,000 employés are affected.

Insurance Against Bad Debts.—In a recent issue of the *Financial Times*, Sir Drummond Drummond Fraser, K.B.E., dealt with the value of credit in the commercial world, touching upon the collapse of credit caused by the war. From this he turned to the question of bad debts, and stated that before the war German banks and insurance companies performed a great work in stimulating German business at home and abroad by insuring those debt risks. Little had been done in this country, but the present time gave an exceptional opportunity to the Government to complete its work of assisting our overseas trade by encouraging private enterprise to undertake the insurance of all kinds of bad debts. Men to work such a scheme with the necessary machinery were available. But the capital required was not so easily obtainable owing to the demand being in excess of the supply. The Government should arrange for the incorporation by Royal Charter of a Credit Insurance Corporation. The capital would be subscribed by the public, and all that the Government would need to do would be to guarantee the corporation against loss. That would secure the subscription of the capital. "In my opinion there would be no risk of loss to the Government, for the premiums charged would include a percentage to reimburse the Government. The experience of the Trade Indemnity Company, in England, and of the many German companies before the war, amply demonstrates the feasibility of the idea. At the present moment the need for such an institution as I have advocated is particularly felt by those engaged in the engineering industries. They could do plenty of export business if long-term credits, insured by a first-rate corporation, were forthcoming. They would be readily forthcoming if the Government established such a scheme, as I have suggested."

Summer Holidays.—MESSRS. ALFRED GRAHAM & CO. announce that their St. Andrews and Amplion Assembly Works will be closed from Friday evening, July 23rd, until Monday morning, August 9th. The Kilmorie Works will be closed from July 30th to August 16th.

Local Exhibition.—MANCHESTER.—In our note on the recent Better Housing and Housekeeping Exhibition we omitted to mention that among the exhibitors were Messrs. Vac-Tric, Ltd., who displayed their electric suction cleaner.

Unemployment.—The Employment Exchange registers for June 7th showed a total of 1,609,100 unemployed persons, as compared with 1,614,212 on May 31st and 1,291,191 on June 8th, 1925.

Price Reductions.—THE BRITISH THOMSON-HOUSTON CO., LTD., has notified the trade of a series of substantial reductions which it has made in the list prices of its radio apparatus. Allowance is being made for existing stocks. At the same time an alteration has been made in the scale of discounts. The alterations came into effect on June 21st.

Copper, Lead, and Rubber Prices.—Messrs. F. Smith and Co. and Messrs. James & Shakespeare report, June 22nd: No change in copper prices.

Messrs. James & Shakespeare report, June 22nd: English pig lead, £31 5s., 15s. dec.

Messrs. Edward Till & Co. report, June 22nd: India-rubber, Para fine, 1s. 8d., 1¼d. inc.

For Sale.—Mr. H. J. Shaw, in conjunction with Messrs. Seymour, Seymour & Co., will sell by auction on June 29th and 30th, at 550-556, Oxford Street, W.C., wireless and X-ray apparatus, headphones, loud-speakers, accumulators, transformers, &c. Messrs. Geo. Cohen & Armstrong Disposal Corporation has for disposal the electric generating plant at the Central Power Station of H.M. Factory, Gretna. Westminster Electric Supply Corporation invites offers for two battery boosters. (See our advertisement pages to-day.)

Lighting and Power Notes.

Barugh.—DEMONSTRATION AT SUPPLY STATION.—Three men have been arrested in consequence of a demonstration recently at the Barugh electricity works of the Yorkshire Electric Power Co.

Beckenham.—NEW SUB-STATION.—The Electricity Committee has obtained a site near Lennard Street for the erection of a sub-station.

Belmont.—SUPPLY AGREEMENT.—The Town Council has decided to approve the draft agreement with the Electric Supply Co. for the supply of electricity.

Blackpool.—APPLICATION FOR SPECIAL ORDER.—The Town Council is considering applying for a Special Order to supply electricity within the urban district of Poulton-le-Fylde and the parishes of Carleton and Marton.

Bournemouth.—OIL FUEL APPARATUS.—The Corporation has authorised the provision of oil-fuel burning apparatus at the generating station in consequence of the coal dispute.

Bromley.—ELECTRICITY UNDERTAKING.—The Town Council is considering exercising its option to acquire the local electricity undertaking during the current year.

Caerphilly.—REVISED CHARGES.—The Urban Council has revised the electricity charges to 7d. per kWh for lighting, and 3½d. for power.

Colne.—YEAR'S WORKING.—The accounts for the year's working (ended March 31st last) of the Electricity Department (engineer: Mr. J. H. Thompson) show an income of £33,676, representing an increase of £754 over the previous year. The expenditure (revenue) amounted to £19,503, as compared with £18,659, leaving a gross profit of £14,173 (£14,263). The net result is recorded as £3,180 profit. The maximum demand on the undertaking for the year was 1,858 kW, an increase of 152 kW. The kWh sold amounted to 3,171,103 and the average price obtained per kWh was 2.37d. The working costs per kWh sold amounted to 1.4d.

Continental.—FRANCE.—The Société de l'Energie de Seine et Yonne, of Paris, has secured the concession for the supply of electrical energy to the rural areas of the Department of Yonne and to a number of villages in the Côte d'Or department.

La Société d'Electricité de Nantes has recently entered into a contract for the distribution of electricity to 37 small communes in the Department of Maine-et-Loire.

CZECHO-SLOVAKIA.—In order to meet the increasing demand for electrical energy, the Anglo-Bohmische Steinkohlen Gewerkschaft, of Lany, has recently installed a 3,750-kVA turbo-generator.

SPAIN.—A new small hydro-electric station has lately been completed by the Sociedad Electrica de Olloniego to utilise the water power of the River Nalon in the province of Asturias. The plant comprises two 500-h.p. Escher Wyss turbines coupled to "Asea" alternators, 50 cycles, three-phase, 6,000 V.

POLAND.—The Société d'Entreprises Electriques en Pologne continues to make steady progress. During the past year concessions were secured for the distribution of electric power in the town of Czenstochowa, for the construction of a regional power station to supply the industrial area between Nowo-Radomsk and Czenstochowa, and for the establishment of a central station at Kielce, where the work is already well in hand.

ITALY.—Among the new electricity transmission lines lately authorised by the Italian Government is an 18,000-V line which the Società Generale Pugliese di Elettricita is erecting to afford a supply of power from the Sila hydro-electric power station to a number of small villages in the province of Taranto. The Società Elettrica del Biferno has also been empowered to erect a 30,000-V line from its power station on the River Biferno to Occhito in the province of Campobasso. The Società Emiliana di Esercizi Elettrici is erecting a 15,000-V line between Mirandala and Vall Alta and between Mirandola and Secchia. A 35,000-V line and also one for 60,000 V are being erected between Polinago and Forneta in the province of Modena by the same company.

Dalkeith.—ELECTRICITY SCHEMES.—The Town Council is to submit three alternative schemes for an electricity supply in the borough.

Dartmouth.—BULK SUPPLY.—The Town Council has decided to offer no objection to the borough being included in a scheme put forward by Torquay Town Council for a bulk supply to surrounding towns, including Dartmouth.

East Grinstead.—APPLICATION FOR LOAN.—The Urban Council has applied for a loan of £5,300 for electricity purposes.

East Ham.—APPLICATION FOR LOAN.—The Electricity Committee is to seek sanction for a loan of £10,000 for the extension of distributor cables.

LOAN SANCTIONED.—The Committee has obtained sanction for a loan of £2,500 for the provision of meters.

Grange-over-Sands.—LOAN SANCTIONED.—The Urban Council has received sanction to a loan for its new electric lighting scheme.

Grays.—NEW CONVERTER.—The Council is to install an additional converter with a capacity of 750 kW.

Hamilton.—BULK SUPPLY CHARGES.—The Town Council has accepted reduced rates for the bulk supply from the Clyde Valley Electrical Power Co., based on a coal clause at 15s. to 10s. per ton.

Hull.—COAL RESTRICTIONS OFF.—The restrictions upon the use of electric power have been lifted from June 18th.

Irish Free State.—BLACKROCK (CO. DUBLIN).—The Urban Council is applying for sanction to a loan of £800 for electric lighting installation.

KINGSTOWN.—The Urban Council has reduced the price of electricity for lighting from 10d. to 8d. per kWh.

Japan. — HYDRO-ELECTRIC DEVELOPMENT. — The Korean Hydro-Electric Co. is about to commence the construction of its first generating station, which is to have an initial capacity of 50,000 kW, to be extended to 100,000 kW.

Leeds.—YEAR'S WORKING.—We have received from Mr. C. Nelson Hefford, manager of the electricity department, a copy of his annual report and revenue account for the year ended March 31st last. The total receipts for the year amounted to £563,901, as compared with £540,917 for the previous year. The working expenses amounted to £222,609, against £215,191, leaving a gross profit of £341,292 (£325,725). The net profit, after the deduction of income tax and loan charges, was £74,018, as against £79,593, out of which £32,362 was contributed to capital expenditure, leaving a surplus profit of £41,656. The capital expenditure during the year was £312,221, bringing the total expenditure up to £4,124,997. The sales for the year amounted to 100,779,954 kWh, and the average price obtained per kWh was 1.34d., as compared with 1.38d. for 1924-25. The working expenses per kWh amounted to 0.53d., as against 0.55d. in the previous year. The maximum load on the undertaking during the period under review was 48,400 kW, the figure for the previous year being 43,500 kW. The addition of a 15,000-kW turbo-alternator has brought the capacity of the station up to 82,000 kW.

Llanfair Caereinion.—INCREASED SUPPLY.—Steps are to be taken to obtain a further supply of electricity.

London.—ISLINGTON.—*Special Rates.*—The Electricity Committee has recommended that any factory solely using electricity for power and using electricity for lighting in at least 75 per cent. of the premises, both factory and offices, be charged a special lighting rate, from 7.30 p.m. to 2 p.m., of 2d. per kWh, plus 10s. per quarter meter rent.

SHOREDITCH.—*Mains Expenditure.*—The Electricity Committee has voted an expenditure of £11,000 for mains, house services and meters.

ST. PANCRAS.—*Mains Extensions.*—The Electricity Committee is to extend mains at a cost of £728.

Ludlow. — ELECTRICITY UNDERTAKING. — The Shropshire, Worcestershire and Staffordshire Electric Power Co. is to take over the electric light undertaking; the charge for electricity is not to exceed 9d. per kWh.

Manchester.—YEAR'S WORKING.—Mr. H. C. Lamb, engineer and manager of the Manchester Electricity Department, has sent us a copy of an abstract of the accounts of the undertaking for the year ended March 31st last. The income for the year amounted to £1,426,238, as compared with £1,445,495 for the previous year. The working expenses are recorded as £789,314, against £767,421, leaving a gross profit of £636,924 (£678,074). After the payment of capital charges and income tax a net profit of £32,856 is left, compared with £63,468 for 1924-25. £365,062 represents the total capital expenditure for the year, which includes £9,635 spent on machinery at the generating stations, £82,530 on the transformer and distributing stations, and £183,762 on mains. The total capital expenditure upon the undertaking now stands at £8,616,715. The number of kWh sold during the year was 300,440,765, as compared with 257,352,920 for the previous year, and the kWh unaccounted for amount to 58,989,726, or 15.24 per cent. of the quantity generated (387,008,090). The maximum demand on the undertaking during the period under review was 136,110 kW, an increase of 15,720 kW on the figure for the preceding year. The average price obtained per kWh during the year was 1.12d., a reduction of 0.21d.

N.E. Lancashire.—COAL SUPPLIES.—A number of municipal authorities in North-East Lancashire are discussing the desirability of restricting power supplies to conserve the existing stocks of fuel.

Newport.—OVERHEAD MAINS.—The Electricity Committee is to erect overhead mains, at a cost of £700, to the Llanwern Garden City Estate.

NEW SUB-STATION.—The Electricity Committee has decided to erect a sub-station at Ebbw Junction.

Northern Ireland.—AHOGHILL.—The local electricity undertaking has been destroyed by fire.

LIMAVADY.—The Urban Council has adopted a scheme for the improvement of the local electric lighting system. It is recommended that a flat rate of 6d. per kWh be charged.

LISBURN (CO. ANTRIM).—The Urban Council has approved a plan for the purchase of energy from the Belfast Corporation.

Norwich.—APPLICATION FOR LOAN.—Application is to be made for sanction to borrow £40,000 for the provision of mains and services.

Oswestry.—SPECIAL ORDER APPROVED.—Subject to certain conditions regarding rates, the Rural District Council has decided not to oppose the proposed Special Order of the Oswestry Electric Lighting and Power Co., Ltd.

Rothesay.—GENERATING STATION AND LOAN.—The Town Council has received permission to erect a generating station, for which it is applying for sanction to a loan of £14,000.

Rugby.—SUPPLY CONSENT.—The Rural Council has consented to the application of the Midland Electric Light and Power Co., Ltd., for an Order to supply electricity to parishes in the Council's area.

Russia.—KAMENEC POWER STATION.—It is announced that the construction of the Kamenec hydro-electric power station will shortly be completed. The cost is estimated at about £73,000.

Southend-on-Sea.—LOAN SANCTIONED.—The Town Council has received sanction to a loan of £10,500 for feeders and distributors.

Southmolton.—APPLICATION FOR SPECIAL ORDER.—The Rural Council has referred an application by Dr. J. A. Purves for consent for a Special Order to supply electricity in the rural area and to the parishes in the area for their opinion.

Spalding.—BULK SUPPLY.—The Urban Council has decided to use underground cables for the bulk supply from Peterborough.

Special Orders.—Applications have been made to the Electricity Commissioners for special orders by the following authorities:—The Linton Mills Estates Co., Ltd., to distribute electricity within the parishes or townships of Grassington, Threshfield and Linton, in the rural district of Skipton, in the West Riding of Yorkshire; the Shoeburyness Urban District Council, to supply electricity within the urban district of Shoeburyness, in the county of Essex; the Urban District Council of Bolsover, to supply within the urban district of Bolsover, Derby; the County Borough of Hastings, to supply within the borough of Rye, the urban district of Battle, the rural districts of Hastings, Rye, and Battle, and the parish of Ninfield in the rural district of Hailsham.

St. Helens.—NEW MAINS.—The Electricity Committee has decided to lay mains to supply the Moss Bank district at an estimated cost of £3,005.

Swansea.—LOANS.—The Electricity Committee is seeking sanction to borrow £150,000 for a scheme of electrical development, and £15,000 for public lighting mains. The Committee has obtained sanction to borrow £20,000 for mains.

Walsall.—MAINS EXTENSIONS.—The Town Council is to spend £1,500 to supply electricity to the Palfrey housing scheme.

Weymouth.—LOAN SANCTIONED.—The Town Council has received sanction to a loan of £6,000 for mains and services.

Tramway and Railway Notes.

Australia.—RAILWAY ELECTRIFICATION.—About £6,250,000 has been spent on the electrification of the railways in the Commonwealth, the result being an increase of £325,000 per annum in the revenue and an annual increase of 21,000,000 passengers.

Continental.—SWEDEN.—The electrification of the railway between Gothenburg and Stockholm has now been completed, with the exception of a little work on the Stockholm-Sodertalje section.

AUSTRIA.—The lines Salzburg-Worgl, Kufstein-Worgl, and Innsbruck-Brenner, a total of nearly 190 miles of double track and nine miles of single track, are being electrified. Energy is being supplied by the Mallnitz and Stubach electrical power stations.

Colne.—YEAR'S WORKING.—The results of the working of the tramways (engineer: Mr. J. H. Thompson) for the year ended March 31st, 1926, show a total income of £24,971, an increase of £219 on the previous year's working. The working expenses amounted to £20,999, a decrease of £745, leaving a gross profit of £3,974, or £965 in excess of the figure for the previous year. After the deduction of loan charges the net balance for the year is £4.969 loss, in addition to which £2,750 has been contributed for the earlier extinguishment of debt, making a total loss of £7,719, as compared with £6,054 for 1924-5. The car-mileage was 275,515, an increase of 161, and the working expenses per car mile amounted to 18.3d.

Glasgow.—FUEL OIL.—In order to conserve its coal stocks, the Tramways Department has adopted oil fuel for generating purposes at the Pinkston power station.

Huddersfield.—PURCHASE OF 'BUSES.—The Tramways Committee has authorised the purchase of not fewer than six new 'buses.

Japan.—RAILWAY ELECTRIFICATION.—The Choshu Railway has been granted a charter to construct an electric railway in Shimoniseki. The Komyo Electric Railway Co. is about to construct a line from Nakaizumi-machi to Kemyaji-mura. The Sendai-Shiogama section of the Miyagi Electric Railway Co. was opened on April 14th.

London.—UNDERGROUND SERVICES.—Normal services of trains were introduced on the Hampstead and City tube railways on June 21st. Improvements can be expected on the District Railway shortly.

STRIKE VOLUNTEERS.—All the men who volunteered as drivers or conductors on the L.C.C. tramways during the general strike have been retained in the service where they so desired.

TRAMCAR AFIRE.—An L.C.C. tramcar on the homeward journey to Streatham on June 15th caught fire at the Elephant and Castle. The traffic was temporarily disorganised.

Wolverhampton.—DISCARDING OF TRAMS.—The Town Council has adopted a recommendation to discard the existing tramway services, with the exception of the Bilston route, for which powers are not held, and to substitute trolley vehicles and motor-omnibuses.

Telegraph and Telephone Notes.

Australia.—"BEAM" STATIONS.—In the House of Representatives on June 14th, replying to Mr. Charlton, leader of the Labour Party, Mr. William Gerrard Gibson, Postmaster-General, stated that the delays in the completion of the "beam" wireless stations in England and Australia were due to causes beyond the control of the Amalgamated Wireless Co. The Government had received a cable from Marconi's Co. stating that the coal strike was holding up the supplies of material. In consequence, the Amalgamated Co. did not anticipate "beam" communication between England and Australia until October, or that there would be a service between Australia and Canada until about December.—*Reuter* (Melbourne).

Austria.—TELEPHONE CABLES.—The League of Nations having released £1,000,000 of the loan to Austria, for underground telephone cables, it is expected that the cable from Vienna to the German frontier at Passau will be finished by the New Year. It will then be possible to talk direct between London and Vienna, says the *Evening News*. Preparations are being made also for the laying of new submarine telephone cables between England and France and Belgium.

Iceland.—TELEGRAPH CONCESSION.—The concession of the Great Northern Telegraph Co., Ltd., in respect of the Iceland cable expires this year. Negotiations between the Danish and Icelandic Governments and the Company have, however, resulted in an agreement granting the Company a prolongation of its concession until the end of 1934, unless previously terminated by notice by either party. The agreement, which has been approved by the Parliament of Iceland, has only been secured by the company's making considerable sacrifices on various points, the total telegraph traffic exchanged with Iceland not being sufficiently large to make both cable and radio services remunerative. Under the new agreement the whole of the telegraph correspondence of Iceland, with the exception of news messages and meteorological telegrams, is retained for the cable route. In return, the company has agreed to make considerable tariff reductions, and to hand over the working of its telegraph station at Seydisfjord to the Icelandic Telegraph Administration.

Irish Free State.—LIMERICK TELEPHONE EXCHANGE.—The telephone exchange at Limerick is being transferred to the General Post Office, where it will be installed in a portion of the telegraph instrument room. A new switchboard, of American type, will be provided, which, it is said, will give more accelerated service for dealing with trunk calls.

Persian Gulf.—MARINE RADIO-TELEPHONY.—Very satisfactory results are reported from the working of the Marconi wireless telephone sets installed on harbour vessels some twelve months ago by the Basrah Port Trust. The ships so equipped in the Persian Gulf are the control vessels *Alert* and *Yenan*, the pilot vessels *Nearchus* and *Liger*, and station ship *Harmaq*, working with shore stations at Tanoomah and Fao. A wireless bell is included in each installation, which is of the Marconi YB type, so that there is no necessity for maintaining a continuous watch; any vessel or station can call any of the others with the facility of an ordinary telephone. The transmitters have a power of 100 watts, and the range for telephony, depending on local conditions, varies from 35 to 80 miles; the radius for telegraphy is from 100 to 200 miles. According to an official report, "all the stations are giving excellent results, and a considerable amount of traffic is effected." Indian signalmen man the stations, and they have rapidly gained proficiency in their work, speech generally being used.

The Telephone Service.—FOREIGN TRUNK CALLS.—Trunk telephone calls over the Anglo-Continental routes during the year ended April 30th are said to have numbered 99? 571.

PHONOGRAMS FROM KIOSKS.—The latest development in popularising the telephone is the facility provided for sending a telegram by 'phone from the public kiosks. The system was inaugurated at Coventry recently. When the person has "called" the exchange in the usual way, the payment of twopence is made as if it were a local call. Then the Post Office clerk asks how many words it is proposed to include in the phonogram, and the cost is stated accordingly. All phonograms are prepaid.

Radio Notes.

Egypt.—MARCONI CO. AGREEMENT.—The Ministry of Communications has published the text of an agreement between the Marconi Co. and the Egyptian Government regarding wireless broadcasting. The agreement is for a period of 30 years, and will be renewable subsequently for periods of 10 years.—*Reuter* (Cairo).

Esthonia.—NEW STATION.—The recently-constructed broadcasting station at Tallinn is to commence operation shortly. Some 500 subscribers are said to have been registered.

Holland.—REOPENING THE HAGUE STATION.—The Commercial Secretary at The Hague (Mr. R. V. Laming, O.B.E.) informs the Department of Overseas Trade that the N.V. "Idzerda-Radio" at The Hague has again received a transmitting licence. The call sign will remain the same as that allotted to this station from 1919 to 1924, when it was closed down owing to the bankruptcy of Mr. Idzerda, namely PCGG; a wave-length of 1,150 metres will be used.

Irish Free State.—DUTY ON APPARATUS.—In Dail Eireann on June 15th, Mr. Norton moved the exemption from the 33⅓ per cent. *ad valorem* duty of component parts and accessories of wireless apparatus. Mr. E. Blyth, Minister for Finance, said it was proposed to confine the tax to completely-manufactured parts; such parts were to be exempt from duty; dismemberment would take place in such a way that the parts could be put together quickly again with very little trouble, and duty in this way avoided. Mr. J. J. Walsh, Minister for Posts and Telegraphs, saw nothing in the proposal that would increase industry. The net result would be that parts of instruments could be imported as against whole instruments, and he had not seen any considerable amount of employment given by the assembling of parts; on the other hand, the tax would create an industry there, certainly in respect of crystal sets. There were parts of valve sets which could not possibly for some time, if at all, be made there. He was satisfied that through this medium an industry would be born which would be helpful to a great many people. The amendments were lost.

New Zealand.—FOREIGN APPARATUS.—Despite New Zealand's 10 per cent. preference on British wireless goods, British manufacturers are being driven from the market, says the *Daily Mail's* Christchurch correspondent, who reports that British manufacturers are sending a crystal set which is useless in New Zealand; consequently importing firms have been forced to abandon British goods. Americans, on the other hand, are sending five-valve sets, which New Zealanders prefer, and have captured the market. In addition, the United States makers give discounts three times larger than those offered by the British firms.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Asia Minor.—BAGDAD.—June 28th. Direction Générale des Chemins de fer d'Anatolie. One electrically-driven s.-m.-portal crane. (A.X. 3191.)*

Australia.—MELBOURNE.—June 28th. Electricity Commission of Victoria. 22,000-V transformers and spares. (B.X. 2528.)*

August 23rd. 10-in. disk suspension insulators. (B.X. 2614.)*

July 14th. Victorian Government Railways. A.c. power interlocking machine. (B.X. 2596.)*

September 1st. Automatic sub-station equipment for Elwood sub-station. (B.X. 2598.)*

August 11th. City Council. H. and l.p., 3-phase sub-station switchgear.*

August 3rd. Postmaster-General's Department. Telephones and dials.*

August 10th. Telephone exchange indicators. (B.X.2597.)*

BRISBANE.—August 26th. City Electric Light Co., Ltd. One 12,500-kW turbo-alternator.*

Belfast.—June 29th. Harbour Commissioners. Two electrically-driven main pumps, &c. Specification, &c., from the Harbour Engineer, Harbour Office, Belfast.

Belgium.—September 29th. Service de l'Armement et des Munitions, 10, Rue du Meridien, Brussels. Wireless-telegraphy sets for use on Belgian military aeroplanes. Particulars (Cahier des Charges Special No. 688) for 4 fr. from 15, Rue des Augustins, Brussels.

ANTWERP.—July 12th. Municipal Council. One single-phase converter, 1 mercury-arc rectifier, 4 static transformers for sub-station. (B.X. 2,637.)*

Brazil.—PORTO ALEGRO.—July 8th. Municipal Council. Electrical material for street lighting. (B.X. 2571.)*

Croydon.—July 5th. Electricity Department. Electric locomotive coal-handling crane and grab and electric crane track. (See this issue.)

Dublin.—June 28th. One steam turbo boiler feed pump, three air filters, two electric vehicles, and steam and water meters. (June 11th.)

Egypt.—CAIRO.—June 30th. Ministry of the Interior. One Diesel engine, direct coupled to an 80-kW generator, complete with switchboard. (B.X. 2537.)*

October 15th. Installation of electric power station equipment at Keneh and Luxor. (B.X. 2627.)*

July 10th. Director-General, State Domains Administration (Commercial Service), Savoy House, Qasr el Nil Street, Cairo. Three semi-Diesel engines and two centrifugal pumps.

August 2nd. Director-General, Mechanical Department, P.W.M., Cairo. 400-b.h.p. Diesel engine, driving an air compressor, together with auxiliary machinery.

Glasgow.—June 28th. Corporation. Electric lighting and telephone installations at the Kelvin Hall. Specifications from Office of Public Works, City Chambers, 64, Cochrane Street.

Grays.—June 30th. Grays Thurrock Urban District Council. H.p. switchgear, 3,300-V, 3-core cable, and transformers. (June 18th.)

Greetland and Stainland.—The Education Sub-Committee has decided to obtain tenders for installing electric lighting at Holywell Green school.

Huddersfield.—July 7th. Electrician's work in connection with the conversion of premises, St. George's Square and Station Street, into shops, for Huddersfield Building Society. Particulars from Messrs. Stocks, Sykes & Hickson, architects, St. Peter's Street, Huddersfield.

India.—July 2nd. India Store Department. E.h.p. armour-clad switchgear. (June 11th.)

July 16th. 500-kW rotary converters with step-down transformers. (See this issue.)

July 16th. Coal- and ash-handling plant for power station. July 30th. Steel-frame buildings and overhead electric travelling crane. August 6th. Complete boiler-house equipment or, alternatively, complete boiler-house installation, including pulverised-fuel equipment, &c. Particulars from the Department, Belvedere Road, S.E.1.

August 9th. Electrical generating plant for Peshawar power station of the North-Western Railway. (B.X. 2644.)*

Littleborough.—June 26th. Electric lighting installation, Zion United Methodist Church, Caldermoor. Tenders to Mr. R. Whipp, 10, Shore Road Littleborough.

London.—BERMONDSEY.—July 15th. Borough Council. Electrical installation for lighting, heating, and power at the baths and washhouses, Grange Road. (June 11th.)

Manchester.—July 7th. Electricity Department. Two 130,000-lb. water-tube boilers, flues, coal chutes, ash hoppers, pipework, valves, induced- and forced-draught plant and chimneys, one 40,000-kW turbo-alternator, with condensing plant, &c. (June 4th.)

Annual contract for supply to various sub-stations of 6,600-V, 3-phase switchgear. Specification from Mr. H. C. Lamb, manager, Electricity Department, Town Hall.

July 5th. 33,000-V trunk feeders, pilot cables, and telephone cables. (June 11th.)

New Zealand.—CHRISTCHURCH.—October 19th Christchurch Drainage Board. Three sets of electric centrifugal pumping plant. (A.X. 3215.)*

WELLINGTON.—August 24th. Public Works Department. Synchronous condensers for the Waikaremoana Electric Power Scheme. (B.X 2608.)*

July 20th. Phase transformer for Mangahao electric power scheme.*

August 30th. 400-V, 3-phase, slip-ring induction motors and starters.*

September 28th. Three electrically-driven low-lift pumps, with control apparatus, for the Taleri drainage. (A.X. 3274.)*

November 2nd. Electric generators and turbines for Waikaremoana electric power scheme. (B.X. 2622.)*

Normanton.—July 5th. Urban District Council. 1,400 yd. feeder cable. (June 18th.)

Electric wiring of 34 houses, Hanson House estate, and 86 houses, Snydale Road. Specification from Mr. J. Hopton, Council Offices, Normanton.

Nottingham.—July 6th. Electricity Department. Twelve months' supply of general stores. (June 18th.)

South Africa.—July 8th. South African Railways and Harbours. Telegraph material, poles, cross arms, &c. (A.X. 3173.)*

August 12th. Electric cables and wires and bare copper wire (for 12 months). (B.X. 2639.)*

JOHANNESBURG.—July 29th. Municipal Council. Transformers. (B.X. 2636.)*

Southend-on-Sea.—Electricity Department. 300 Relay switches for distant control of street lamps. (See this issue.)

Uruguay.—MONTEVIDEO.—July 6th. State Electricity Works. 1,000,000 metres of insulated conductors. (B.X. 2523.)*

July 9th. 137,500 metres of rubber-insulated wires and cables. (B.X. 2548.)*

40,000 metres of coloured twin conductor cords. (B.X. 2549.)*

July 22nd. 35,000 electric lamps.*

Whitley Bay.—July 1st. Whitley and Monkseaton Urban District Council. Wiring for electric lighting 66 houses. Specifications from Mr. A. J. Rousell, surveyor, Council Offices, Whitley Bay.

Wolverhampton.—July 10th. West Midlands Joint Electricity Authority. Two turbo-alternators, condensing plant, &c., for Birchills power station. (June 18th.)

The Transport Committee has decided to obtain tenders for vehicles, equipment, &c., in connection with the conversion of Penn Fields route to trolley-vehicle working.

July 24th. West Midlands Joint Electricity Authority. Three steam boilers, pulverised fuel plant, ash and coal handling plant and boiler house auxiliaries, for Birchills Power Station. (See this issue.)

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Beckenham.—Electricity Committee. Accepted:—
H.p. cable (£15,610).—British Insulated Cables, Ltd.
16,000 yd. .007 cable (£14,791).—Hackbridge Cable Co., Ltd.

Brighton.—Electricity Committee. Accepted:—
1,000-kW motor converter (£8,471).—Bruce Peebles & Co., Ltd.
Two complete units of steam generator plant for Southwick Works (£44,967).—Combustion Steam Generator, Ltd.

Devonport.—Royal Albert Hospital. Accepted:—
Electric lift (£600).—Smith, Major & Stevens, Ltd.

East Ham.—Electricity Committee. Recommended:—
1,450 yd. lead-covered cable (£513).—Enfield Cable Works, Ltd.

Edinburgh.—*The Times* states that on Tuesday last the Electricity Committee decided to recommend the Town Council to accept a Swiss tender for the installation of two 25,000-kW turbo-alternators at a cost of £138,000. The lowest British offer was £52,000 more.

Faversham.—Town Council. Accepted:—
Installation of electric fire bells at the residences of the members of the fire brigade.—Jabez Smith & Son.

Government Contracts.—The following Government contracts were placed during May, 1926:—

ADMIRALTY CONTRACT AND PURCHASE DEPARTMENT.
Aluminium alloy electrical fittings.—General Electric Co., Ltd.; W. McGeoch & Co., Ltd.; Engineering & Lighting Equipment Co., Ltd.
C.T.S. electric cable.—Anchor Cable Co., Ltd.; General Electric Co., Ltd.
Underground cables and switchgear.—Johnson & Phillips, Ltd.
Conduits and accessories.—Eureka Conduits & Fittings Co.; Electric Conduits, Ltd.; Barton & Sons, Ltd.; General Electric Co., Ltd.; Talbot Stead Tube Co., Ltd.
Electric light installation.—G. E. Taylor & Co.
Lifts.—Smith, Major & Stevens, Ltd.
Motor.—Laurence Scott & Co., Ltd.
Motor alternators.—Small Electric Motors, Ltd.
Motor generators.—Small Electric Motors, Ltd.
Switchboards.—Park Royal Engineering Co., Ltd.
W/t attachments.—Radio Instruments, Ltd.

WAR OFFICE.
Electrolyte.—Spencer, Chapman & Messel, Ltd.
Wireless sets.—Marconi's Wireless Telegraph Co., Ltd.

AIR MINISTRY.
Inert batteries.—Edison Swan Electric Co., Ltd.
Voltage control boxes.—Pyne Manufacturing Co., Ltd.
Duralumin.—J. Booth & Co. (1915), Ltd.
Electric cable.—W. T. Henley's Telegraph Works Co., Ltd.
Magneto spares.—British Thomson-Houston Co., Ltd.
Motor-alternator set.—Newton Bros. (Derby), Ltd.

POST OFFICE.
Manufacture, supply, drawing-in and jointing cable.—Holborn-Chiswick: Standard Telephones & Cables, Ltd.
Private branch telephone exchange equipment.—Burberry's (W.); Corporation of Bootle; British Celanese Ltd. (S.W.); Metal Agencies Co., Ltd. (Bristol); Stelp & Leighton, Ltd. (E.C.); Corporation of Glasgow Housing Department and City Improvements Department; Corporation of Glasgow; Manchester and Salford Equitable Co-operative Society, Ltd. (Ardwick); Walsall and West Bromwich Union Joint Committee: Relay Automatic Telephone Co., Ltd.
Telephone exchange equipment.—Putney, Brixton, Darlaston: Standard Telephones & Cables, Ltd. Leamington, Chatham, Gillingham (Kent): Siemens Bros. & Co., Ltd.; sub-contractors—Small Electric Motors, Ltd., for dynamotor; Chloride Electrical Storage Co., Ltd., for batteries; English Electric Co., Ltd., for charging machines; Crompton and Co., Ltd., for ringing machines. Strood (Kent), Snodland (Kent), and Rainham (Kent): Siemens Bros. & Co., Ltd.; sub-contractors—Small Electric Motors, Ltd., for dynamotors. Harrow, Sketty, Leek: Siemens Bros. & Co., Ltd. Bearsden (Glasgow): Automatic Telephone Manufacturing Co., Ltd. Nelson, Burslem, Hanley: General Electric Co., Ltd.; sub-contractors—D.P. Battery Co., Ltd., for batteries; Crompton & Co. for machines. Stoke-on-Trent, Longton (Staffs), Newcastle-under-Lyme (Staffs.): General Electric Co., Ltd.; sub-contractors—D.P. Battery Co., Ltd., for batteries; Crompton and Co., Ltd., for charging machines; Automatic Telephone Mfg. Co., Ltd., and W. Jones & Co. for ringing machines. Trentham (Staffs.), Chesterton (Staffs.): General Electric Co., Ltd.; sub-contractors—W. Jones & Co. for ringing machines.
Fire alarm apparatus.—A. C. Brown.
Telegraph apparatus.—Creed & Co., Ltd.
Telephone apparatus.—British L.M. Ericsson Mfg. Co., Ltd.; Peel-Conner Telephone Works; Siemens Bros. & Co., Ltd.; Standard Telephones and Cables, Ltd.; Telephone Mfg. Co., Ltd.
Miscellaneous apparatus.—Phœnix Telephone & Electric Works, Ltd.
Distributing boards.—Cable Accessories Co., Ltd.
Cable (various).—British Insulated Cables, Ltd.; Callender's Cable and Construction Co., Ltd.; Connolly's (Blackley), Ltd.; Enfield Cable Works, Ltd.; W. T. Glover & Co., Ltd.; Hackbridge Cable Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Johnson & Phillips, Ltd.; Macintosh Cable Co., Ltd.; Pirelli-General Cable Works, Ltd.; Siemens Bros. & Co., Ltd.; Standard Telephones & Cables, Ltd.; Union Cable Co., Ltd.
Dry cells.—Ever-Ready Co. (Great Britain), Ltd.; General Electric Co., Ltd.; Siemens Bros. & Co., Ltd.
Telephone cords.—London Electric Wire Co. & Smiths, Ltd.; Reliance Electrical Wire Co., Ltd.; Siemens Bros. & Co., Ltd.; Standard Telephones & Cables, Ltd.
Ducts.—Albion Clay Co., Ltd.; Donington Sanitary Pipe & Fire Brick Co., Ltd.
Battery plates.—Accumulators of Woking, Ltd.; Alton Battery Co., Ltd.; Tudor Accumulator Co., Ltd.
Battery charging sets.—Stuart Turner, Ltd.
Jointing sleeves.—Dugard Bros., Ltd.; C. M. Powell Bros.
Flameproof wire.—Macintosh Cable Co., Ltd.

CROWN AGENTS FOR THE COLONIES.
Insulated cables.—St. Helens Cable & Rubber Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.
Cable and wiring material.—Siemens Bros. & Co., Ltd.
Cableway aerial.—J. M. Henderson & Co., Ltd.
Electrical equipment.—J. Stone & Co., Ltd.
Overhead line material.—Bullers, Ltd.
Static transformers and spares.—Ferranti, Ltd.
Telephone switchboards.—British L.M. Ericsson Mfg. Co., Ltd.
Electric truck.—Ransomes, Sims & Jefferies, Ltd.
Copper wire.—Shropshire Iron Co., Ltd.
Bronze wire.—T. Bolton & Sons, Ltd.

Hemsworth.—Rural Council. Accepted:—
Wiring 50 houses at Great Houghton, at 25s. per point, including the provision of plain shades and globes.—Houghton Main Colliery Co., Ltd.

London.—ISLINGTON.—Electricity Committee.
10,000-kW turbo-alternator (£51,330).—Metropolitan-Vickers Electrical Co., Ltd. (Accepted.)
Installation of interlinking mains with Hackney and St. Pancras.—British Insulated Cables, Ltd. (Recommended.)

HACKNEY.—Works Committee.
One 40-cell I.M.V.8 "Exide-Ironclad" accumulator, less allowance for the old battery (£158).—Chloride Electrical Storage Co., Ltd. (Recommended.)

Southend-on-Sea.—The Town Council has renewed for another year the existing contract with Callender's Cable and Construction Co., Ltd., for cables based upon the daily market price of copper and lead as disclosed by Bagot's list.

Wirral.—Board of Guardians. Accepted:—
Installing electric lighting, heating, &c., at the extensions to the Institution at Clatterbridge (£12,322).—Ashwell & Nesbit, Ltd.

Forthcoming Events.

Second British Electro-Farming Conference.—Thursday, July 8th. At the Royal Agricultural Society Show Ground, Reading. At 12 noon.

Notes.

Electric Arc-Welding a Bridge.—The Worcestershire County Council has now decided, after investigation, to strengthen Holt Fleet bridge (over the River Severn) by the method of electric-arc welding as applied to the bridges on the Paris, Lyons and Mediterranean Railway. The cost of the welding is estimated at about £4,000 and the masonry abutments at a further £4,300.

Inventions Commission.—The Inventions Commission, sitting at the Law Courts in London on June 14th, under the chairmanship of Mr. Justice Tomlin, heard the claim of Prof. Miles Walker in respect of supersonic signalling. Prof. Walker claimed for an exceedingly small fraction of the effort that was made by a large number of experimenters to solve a very difficult and important problem—how to detect and locate a silent submarine. He did not claim that his work on the solution of that problem was as great as that by many other experimenters in that field, but he was the first to suggest to the Admiralty a very promising line of attack on submarines. His first experiments in submarine echoes were made in 1899 after the sinking of the *Stella*, when he was a student at Cambridge. He thought it was possible for a ship to get warning of hidden rocks by means of a submarine echo. In 1912, when he was appointed to Manchester, a student under his direction made experiments for the detection of high-frequency sounds. In 1913 he was sold a patent which had been evolved for the detection of icebergs. After the war broke out he explained his device to the Admiralty, and experiments were carried out with a water siren for the detection of submarines, but his suggestion was not adopted. Another method, however, was found to be more satisfactory. The Commission reserved its decision.

Flood Interruption of Supply.—The energies of some 30 men employed for the past three weeks by Captain J. A. Ritter in endeavouring to repair a breach in the "lead" which supplied the water power to the power station at Limavady have again been nullified through the recent abnormal rainfall, causing a heavy flood in the River Roe. A large tree, brought down by the flood, broke the sluice gates in the river, and caused the torrent to rush into the "lead," breaking the river bank. Captain Ritter has been able to supply light to the town for a few hours each evening, generated from a dynamo in the Rectory grounds. It will be some time before current can be generated at the station, so inconveniently interrupted.

Development of French Electrical Works.—M. de Monzie, the French Minister of Public Works, referred at length to the question of the development of the national electrical equipment at the recent annual dinner of the Union des Syndicats d'Electricité. Reference was made to the law passed recently by the Chamber, intended to impose a tax of 5 per cent. on consumers of energy so as to provide funds for the provision of electrical works. It is stated that the Professional Syndicate of Producers and Distributors of electrical energy, which mainly represents the steam power stations, is particularly interested in the matter, and has unanimously expressed its agreement with the scheme in principle, and that the Chambre Syndicale des Forces Hydrauliques is equally favourable. The Union des Syndicats d'Electricité, which combines all the electrical syndicates, will examine the problem at its meeting in July.

Chromium Plating.—The electro-deposition of chromium is exciting considerable interest owing to its anti-corrosive property when deposited upon non-ferrous metals being strongly marked. Articles of brass, nickel silver, copper, &c., when plated with chromium, appear to withstand climatic conditions and exposure indefinitely. In the case of non-ferrous metals, the deposit is unique; it is virtually glass hard, and is capable of receiving a brilliant polish which will withstand rough handling without becoming scratched or the polish in any way diminished. The colour is of a silvery whiteness tinged with blue, and its great hardness is allied with heat resisting properties. The deposition of the metal is slightly more difficult than the deposition of nickel, but the plant required is only a slight departure from the standard equipment. Messrs. W. Canning & Co., Ltd., have furnished us with a sample article finished in chromium, and have, we understand, installed several plants for the deposition of the metal, which have been a proved success.

Association of "Old Cromptonians."—The members of this Association held their second annual dinner on Friday, June 18th, at the Royal Automobile Club. Originally the meeting was fixed for the nearest Friday to Col. Crompton's birthday, but the strike caused a postponement, while the new date found very many members at the Glasgow Convention, and this reduced the attendance, which otherwise would have reflected the desire of all to welcome the grand old president on his return from the United States. We learn that the "Guv'nor" was in excellent form in giving a brief account of his American impressions. These may be crystallised with the observation that you can say to an American anything except that "It's a young country and has room for improvement." The general meeting re-elected Mr. C. S. Peel as hon. secretary and Mr. M. Whitgift as hon. treasurer and assistant secretary, and a committee consisting of Messrs. E. J. Fox, H. D. Harris, Lt.-Col. H. M. Leaf, D.S.O., J. W. Meares, C.I.E., A. E. Mohring, E. Reeves, A L. Stevens, and J. Swinburne, F.R.S.

Royal Air Force Display.—The seventh Royal Air Force display will take place at the Royal Air Force aerodrome, Hendon, on July 3rd. The object is to demonstrate the progress in the work, training, and equipment of the Royal Air Force, and as participation in the display is largely competitive it affords a valuable stimulus to training. The proceeds are given to the Royal Air Force Memorial Fund, which has already benefited to the extent of more than £34,000 since the display was established six years ago. An event which will have a popular appeal will be squadron drill carried out by wireless telephony, orders being given by the squadron leader from his machine in the air, or from the wireless ground station. The use of wireless telephony, although still somewhat in the experimental stage, has already shown that it greatly facilitates squadron operations; it enables the leader to pass his instructions with certainty, and it enables the pilots to understand clearly what air manœuvres they are to carry out. Arrangements are being made to develop the use of "public address" equipment by the incorporation of 20 or more Marconiphone loud speakers erected on pylons in the different enclosures, each pylon being connected with the control room in the hotel by means of underground cables.. Precautions are being taken this year to guard against the interference experienced while receiving from aeroplanes last year. Four receiving stations will be used, each one receiving independently of the other. All will be connected by land lines with the control room, but it is expected that the main reception will take place at a point within five miles of the Hendon aerodrome. This reception point will be coupled by Post Office land line to the control room. It has been found that the best reception is obtained when aeroplanes are some distance from the receiving point.

The Magnetic Elements at Greenwich.—The report of the Astronomer-Royal for the past year states that in 1925 the declination W. was 13 deg. 10 minutes; the horizontal force was 0.18413, and the vertical force 0.43081, c.g.s. units; the dip was 66 deg. 51.5 mins. Magnetic observations at Greenwich will shortly be discontinued, the work being transferred to Abinger, on account of the electrification of the railways near the Royal Observatory.

The wireless time signals received from the Continent are slightly late on Greenwich, the Eiffel Tower lagging 0.11 sec. and Nauen 0.05 sec.

The Shortt free-pendulum clock is working well, and a second clock of this type is being installed; the rate of the first one is increasing by 0.011 sec. per day, per month.

Water Power in Newfoundland.—In a recent report (Stationery Office, 2s. 3d. net) upon conditions in Newfoundland, Mr. F. W. Field, Senior Trade Commissioner in Canada and Newfoundland, says that there is considerable water power in the Colony, but recent estimates are not available. Little has been done to develop them, with the exception of the work of two paper companies. The Anglo-Newfoundland Pulp and Paper Company has utilised power both at Grand Falls and Bishop's Falls. About 23,000 h.p. has been developed out of an available 30,000 to 35,000 h.p. The water is conveyed from the forebay to the power house, a distance of about 2,000 ft., by means of two steel pen-stocks 15 ft. in diameter. The net maximum head is 110 ft. The maximum head to which it was possible to develop the power at Bishop's Falls was 36 feet. Eight sets of 1,700 h.p. each were provided, and seven of these were fully developed, six of them being directly connected to three pulpwood grinders each, and one driving a 500-kW generator and, by means of rope drives, various pieces of machinery throughout the plant. The remaining set will eventually be used for the generation of more electrical power when required. The power required by the Newfoundland Power and Paper Company, which established its pulp and paper mills at Cornerbrook, is obtained from Deer Lake, 32 miles away. Construction of the hydro-electric plant and of the paper mills by the general contractors was commenced in June, 1923. Paper was produced in July, 1925, very little over two years after the inception of construction. The power plant at Deer Lake has a capacity of 100,000 h.p., which is transmitted to the mills over four transmission lines. The average head on the turbines is from 250 to 265 ft. The flow of water for the power development is obtained from Grand Lake, which has an area of 215 sq. miles and a drainage area of 1,650 sq. miles. From this an average yearly flow of 5,000 cu. ft. per second is available. Owing to the large seasonal variations in the flow of water from this area, Grand Lake is being used as a regulating storage reservoir with a capacity of about thirty thousand million cubic feet. To control this reservoir, a hollow reinforced concrete dam, 800 ft. long and 75 ft. high, was constructed. The dam has a spillway with a capacity of 26,000 cu. ft. per sec. for the purpose of discharging the occasional heavy floods which occur. This consists of eighteen 15-ft. wide electrically-operated sluiceways. Owing to the increased height of Grand Lake, which is raised some 30 ft. by this dam, a diversion of the railway was necessary, and it is carried over Junction Brook on the dam. To convey the water from Grand Lake to Deer Lake power house, a canal seven miles long was built. Formerly pulp and paper mills were always erected at or very near the hydraulic power. To-day many of them are located to suit other conditions—housing of operatives, pulpwood supply, shipping, etc., the hydraulic power being converted into electrical power and transmitted to the pulp and paper mills.

Electricity v. Gas at Weymouth.—The Estates and Housing Committee of the Weymouth Council recently made a recommendation that the local Gas Company should not be allowed to install gas cookers in certain of the Council's houses. A great deal of discussion occurred when the matter came before the Council. The Committee's view was that the municipal electricity undertaking should be given preference over the Gas Company in municipal houses, but a number of members objected to such a "monopoly" and thought that the tenants should be free to choose electricity or gas. A councillor stated that before the houses were erected the Gas Company was asked if it would install gas cookers, but it refused to do that unless it was also permitted to fit gas coppers, geysers and lighting. The chairman of the Electricity Committee said that they could install electric cookers at as low a cost as the Gas Company could do gas cookers. It was decided to refer the recommendation back to the Committee with a proposal that consent to install gas cookers only should be given to the Gas Company.

The Shannon Scheme.—Recent developments in connection with the work on the Shannon hydro-electric scheme at Ardnacrusha, Co. Limerick, include the erection of a fire station, with hydrants at danger points, three miles of hose being provided; and the erection of a school for about 35 or 40 German children, whose fathers are engaged on the scheme.

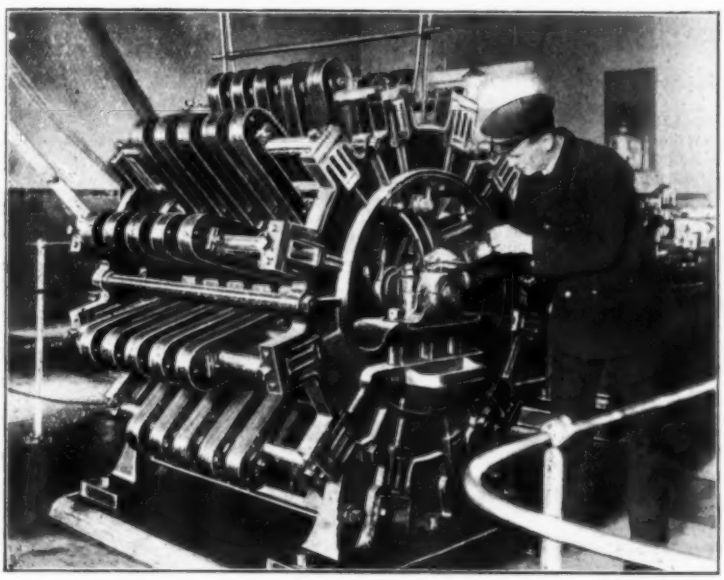
Fatality. — George Chrich (13), of Rossington, was killed recently when climbing an 11,000-V transmission standard of the Yorkshire Electric Power Company, after a bird's nest. The boy apparently touched the transmission wire and received a fatal shock, his legs being severed at the knees and the fingers on one hand burnt off. He appeared to live for a few minutes before falling dead to the ground. At the inquest a verdict of "Accidental death" was recorded.

Gold from Mercury.—The claims by Drs. Miethe and Hantaro Nagaoka to have produced gold from a base metal, mercury, have for some time been subjected to sceptical criticism in the scientific world, and the subject was discussed at a recent meeting of the German Chemical Society in Berlin. It was suggested by one professor that the presence of gold even at a distance, as in the operator's spectacle frames, or in metal compounds in an adjoining room, might spoil the experiment through its being drawn in ultramicroscopic quantities into the electric current, by an effect like that of the cathode rays. Other criticism pointed to the suggestion that there were always traces of gold in mercury which would vitiate the results of the experiment. Prof. Miethe said that in 42 experiments the output of gold was constantly proportional to the current and the time of the process. The claims of Prof. Miethe are supported by those of Dr. A. Gaschler to have produced mercury from gold. The process consisted, according to *Science*, of sealing a gold electrode in a vacuum tube and bombarding it with a stream of positive hydrogen atoms shot through the tube at a high velocity. After 30 hours' bombardment the spectrum lines from the gold indicated the presence of mercury, which became stronger as time elapsed.

Village Water Power.—At the annual meeting of Messrs. James Finlay & Co., Ltd., Glasgow, Mr. W. Brown, who presided, said that at Deanston, where most of their employés lived on property owned by the company, they were arranging for the erection of more houses, which they hoped would enable all their looms there to be run. They had water available for power purposes and intended to light not only the new houses but the whole village electrically.

Exhibition of Inventions.—The second International Exhibition of Inventions, organised and managed by the Institute of Patentees (Inc.), is to be held at the Central Hall, Westminster, from October 13th to 26th next. The exhibits will be arranged in two sections, A for inventions on the market, open to any potential exhibitor, and B for inventions on the market, open to members of the Institute of Patentees. Applications for space in both sections are invited. Full particulars may be obtained on application to the Institute, 39, Victoria Street, Westminster, S.W.1.

Lighthouse Electrical Equipment.—We reproduce herewith a photograph of the electrical generator installed at the Lizard Lighthouse, Cornwall, for supplying the signalling apparatus. It is a De Meritens alternating current magneto-electric machine of French make. The field system consists of five sets of twelve permanent magnets, sixty in all, each magnet being made up of eight steel plates. The armature is 2 ft. 6 in. in diameter, and is composed of five rings with twenty-four bobbins in each ring arranged in six groups of four bobbins each. The machine develops, with the arc lamp in the circuit, a current of about 150 A at 30 V. The slip-rings and the brushes are arranged so that 2/5ths, 3/5ths, or the whole of the current can be used. The machine runs at 600 r.p.m., giving a periodicity of 120 cycles. The machine was installed at the Lizard in 1893, having been previously used for experimental work at South Foreland Lighthouse. A smaller machine of the same type, which runs at 910 r.p.m., is also used as a stand-by. A pair of similar machines have run the light at St. Catherine's Lighthouse, Isle of Wight, since 1887.



Permanent-Magnet Alternator at the Lizard Lighthouse.

New Uses for Beryl.—The Canadian Department of Mines reports a great increase in the demand for beryl, a mineral whose new uses include substitution for feldspar in the manufacture of sparking-plug and insulator porcelain.

Power Line Communication.—What is claimed to be the first repeater for high-frequency telephone communication over power transmission lines has recently been installed by the Westinghouse Electric & Manufacturing Co. in America, as a result of which Indianapolis is now connected to Terre Haute by means of a 132-kV line and to Kokomo by means of a 66-kV line (both generating stations, while that at Indianapolis is a transformer sub-station). The lines from Terre Haute and Kokomo terminate in their respective transformer banks, the two systems being electrically isolated in so far as the high-pressure lines are concerned. High-frequency wireless telephone equipment had previously been installed at all three points, and the system load dispatcher is located at Indianapolis, where the repeater installation is also located. The two-frequency duplex system employs one frequency for transmission and a different frequency for reception which function entirely independently, and both may proceed simultaneously. Mr. C. A. Boddie, of the Westinghouse Co., states that simultaneous transmission and reception is an absolute necessity, and the repeater must perform both operations at the same instant. The achievement of repeater action at Indianapolis required no additional apparatus nor alteration in the normal mode of operation—only the insertion of a suitable transformer between the output circuit of the high-frequency receiver and the speech-input circuit of the transmitter, thus coupling the circuits together. An incoming signal or talk from either direction is thus applied directly to the transmitter, which is accordingly modulated just as though the distant speaker were at Indianapolis instead of at one end of the line. The transmitter, therefore, faithfully repeats what comes into it, to the station which it is desired to reach, and also feeds back to the station where the signal originated; when the operator at Terre Haute is talking to Kokomo all three stations are in action, each transmitter delivering its normal high-frequency output to the line.

The "tie-back" between the receiver and transmitter which converts the Indianapolis equipment into a repeater not only enables it to function as a repeater, but also permits three-party conversation between the load dispatcher at Indianapolis and the Terre Haute and Kokomo operators. It is claimed that the ease and simplicity with which a standard two-frequency duplex system can be made to function as a repeater permits extremely long lines to be operated, and dissimilar systems which are electrically isolated, tied together in a communication system. It offers a valuable means of getting past a break in a line, for if a line is sectionalised at a point where a telephone set is installed, such a set can be converted into a repeater, and the break by-passed without loss in signal strength or resort to special coupling devices.

The Position of the Combustion Engineer.—Referring to recent correspondence in the technical Press on this subject—obviously that which appeared in our pages some time ago—and an article by "a well-known combustion expert," evidently that of Mr. Charles F. Wade, published in our issue of December 25th, 1925, p. 1014, Mr. E. B. Pausey discussed this question in the April issue of *The Electrical Power Engineer*, pointing out that the term "Combustion engineer" needs definition, and that the Schedule of Salaries and Conditions should be expanded to define the duties and responsibilities of the engineers employed in power stations. He puts forward the following suggestion for a standardised technical staff for a power station of about 16,000-kW installed capacity: "Assistant Shift Engineer, to attend to the switchboard and look after the turbine room in the shift charge engineer's absence, Grade 9 or 8b; Testing and General Assistant to Boiler-House Superintendent, to test coal and water, attend to recording and other instruments and assist in the work of the boiler house as required, Grade 8a; Shift Charge Engineer, who, being provided with an assistant to relieve him of much of the turbine-room routine work, should devote most of his attention to the operation of the boiler house, Grade 8; Boiler House Superintendent, complete charge of boiler operation, repairs and maintenance of boilers and plant connected therewith, Grade 6; Power-Station Superintendent, generally responsible for the operation, repairs and maintenance, and organisation of the whole of the power-station plant, Grade 3. A scheme like this would have several advantages over the haphazard arrangements in vogue at the present time. It would provide a logical ladder of promotion, at each step of which the engineer would be able to fit himself for the next step; it would define the duties and fix the minimum salaries for the different steps; and it would ensure a well-organised staff, which need contain no elements of discord, and would be capable of working together as a unit and manifesting a team spirit. It will be noted that there is no excrescence of the nature of an independent 'combustion engineer' to introduce discord into what should be a harmonious whole; on the other hand, at each step of increasing responsibility, the engineer would continue to be responsible to his superior until finally the Power Station Superintendent would be responsible to the Chief Official, either directly or through the Deputy Chief where such an official exists. At the same time, with the exception of the member in the lowest grade, all the officials will be combustion engineers, for their duties consist, at least to a very important extent, of the supervision of combustion or processes subservient thereto. I think the staff I have now described would be typical of efficiently organised power stations of that capacity and somewhat larger; in still larger plants, of course, the personnel of the technical staff would correspondingly increase by the addition of various assistants."

Lecture.—"Is Scientific Invention becoming a Nuisance?" is the subject of the lecture at the London School of Economics on July 6th at 5-30 p.m. in aid of the King Edward's Hospital Fund. Prof. A. M. Low is one of the speakers.

Appointments Vacant.—Telephone engineer (£800) for the United River Plate Telephone Co., Ltd. Electrical engineers (£250+) for the Tropics. (See our advertisement pages to-day.)

Direct Electric Iron Production.—At a meeting of shareholders of the Uddeholm Company at Stockholm it was stated that trials had been made during the past few months at the Hagfors ironworks of the method of direct electric iron production invented by the chief engineer, M. Flodin. The trials proved the possibility of producing forgeable iron in this way, but nothing is yet known definitely of the economic aspects of the process. The Uddeholm company has not yet acquired the method, but has reserved priority of the right to do so if it proves economically profitable.—*Reuter's Trade Service* (Stockholm).

Institute of Transport.—ANNUAL CONGRESS.—The Council of the Institute, after considering certain alternative venues to Birmingham, has reluctantly been constrained to abandon the idea of holding a congress this year. The annual dinner of the Institute, originally fixed for April 21st last, will take place at the Hotel Cecil, London, on November 18th.

EXAMINATIONS.—The next examinations will be held in the last week in April, 1927. Centres tentatively decided upon are: London, Birmingham, Bristol, Leeds, and Manchester. Arrangements will be made for holding examinations in South Africa, India, Australia, New Zealand and South America, or other centres overseas from which a satisfactory number of candidates may be forthcoming.

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements).

The Monmouth Town Council has decided to increase the salary of the electrical engineer by 10s. weekly and to grant him a coal allowance up to 10 tons annually.

The *Daily News* states that Mr. JAMES W. MCKAY, Birdhurst Rise, South Croydon, has been appointed general secretary of the Electrical Wholesalers' Federation, Ltd.

Sir ERNEST RUTHERFORD has been elected a member of the Academy of Sciences of Cracow.

It is announced in the Press that Mr. ARTHUR HYLAND, the Special Commissioner of the Australian Government and Director of Trade and Publicity, has arrived in London.

Mr. HARRY HALL, of Nelson, has accepted an important post with Messrs. Parkinson (Australia), Ltd., of Sydney, and is sailing on July 2nd from Tilbury. Messrs. Parkinson are associated with Messrs. F. & A. Parkinson, Ltd., of Guiseley, Leeds, for whom Mr. Hall has been the Manchester manager for two years.

The Faversham Town Council has increased the salary of the electrical engineer, Mr. G. SOMERVILLE, from £416 to £500 per annum.

The Marconiphone Co., Ltd., announces that Mr. F. W. PERKS, who until recently was its London manager, has been appointed general sales manager. The duties of London manager will be taken over by Mr. E. A. OAKMAN.

Mr. HAMLYN DRAKE, B.A., who served in the Horse Artillery in Palestine, and acted as A.D.C. to General King, has been elected a director of Messrs. Drake & Gorham, Ltd. Mr. Hamlyn Drake, who is the only surviving son of Mr. Bernard Drake went through the B.T.-H. works at Rugby, and made a study of electric furnaces in America.

Upon the thirtieth anniversary of the granting of the first Marconi wireless patent, Senatore MARCONI was honoured by his native town, bologna, Italy. Among other things, a number of annual prizes and gold medals were instituted for award to students.

It is announced that Sir ALEXANDER B. W. KENNEDY having, owing to advancing years, resigned his position as director and engineer-in-chief of the Westminster Electric Supply Corporation, Ltd., the board has appointed the general manager, Mr. W. A. PEARMAN, to fill the vacant seat on the board. Mr. P. L. RIVIERE, who is resigning the position of electrical engineer in the L.C.C. Tramways Department, has been appointed engineer-in-chief of the company. Sir Alexander Kennedy was born in March, 1847.

Mr. G. S. W. MARLOW, B.Sc., F.I.C., has been released by the Association of British Chemical Manufacturers to devote part of his time to the appointment of secretary and editor to the Faraday Society and secretary of the Institute of Physics, pending the completion of final arrangements for carrying on the official work of these bodies. Mr. Marlow was assistant secretary to the Institute of Chemistry from 1919-1925.

Mr. W. J. E. BINNIE (Sir Alexander Binnie, Son & Deacon) has been elected chairman of the committee of the Association of Consulting Engineers for the year 1926-1927.

Mr. F. W. FIFIELD has resigned his position as manager of the Bristol depôt of the Edison Swan Electric Co., Ltd.

Brighton Lighting Committee recommends that Mr. J. CHRISTIE, chief engineer and manager, be authorised to visit the United States to study electricity developments, particularly in relation to the new machinery, and that he be granted for the purpose an allowance of £400.

Mr. W. A. BENGER has taken up the agency for Yorkshire for the Electrical Apparatus Co., Ltd., London.

Obituary.—MR. A. V. DOWNTON.—The death took place at Southbourne, Bournemouth, on June 14th, of Mr. Albert Victor Downton, of Lesney View, Lesney Park, Erith, who was up to the time of his death general manager and technical adviser of the Enfield Cable Works. He was 53 years of age, and commenced his career at Callender's works at Belvedere, where for some years he was manager of the cable department. Before becoming associated with the Enfield Cable Works he was for some time with the Pirelli cable works at Southampton.

LADY NOBLE.—We desire to tender our condolences to Sir William Noble, formerly engineer-in-chief to the G.P.O., and now a director of the British Broadcasting Co. and of the General Electric Co., Ltd., on the death of Lady Noble, which occurred at Leamington on June 21st, at the age of 61 years.

MR. J. CORSON.—Mr. John Corson, of the Shanghai Municipal Electricity Department, Shanghai, has died in the General Hospital there at the age of 26 years. Mr. Corson, who began his career in the Kilmarnock Corporation Electricity Supply Department, was engaged by the Shanghai department in 1922 as meter assistant.

Will.—The late Sir T. A. COGHLAN, Agent-General in London for New South Wales and a director of the West India and Panama Telegraph Co., Ltd., left property of the value of £1,420 in England, with net personalty £239.

New Companies Registered.

C. H. Rees & Co., Ltd. (214,363).—Private company. Registered June 14th. Capital, £3,000 in £1 shares (2,500 preference and 500 ordinary). Objects: To adopt an agreement with L. Jacobs (London), Ltd., and to carry on the business of agents for, or merchants of electrical supplies and glassware, referred to therein. The life directors are:—W. Rose, Stonington, Station Road, Hendon, N.W.4, manufacturer (chairman); C. H. Rees, 3, Mayfair Road, West Jesmond, Newcastle-on-Tyne, merchant; F. P. Onate, 70, Wandsworth Bridge Road, Fulham, S.W., merchant. Qualification, £100. Remuneration as fixed by the company. Secretary: W. J. Braine. Solicitor: F. H. Stollard, 73, Basinghall Street, E.C.2. Registered office: 6, Dyers Buildings, Holborn, E.C.1.

Bel Canto Radio Reproducer Co., Ltd. (214,392).—Private company. Registered June 16th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in loud speakers, gramophones and sound producing or reproducing or recording instruments of all kinds, &c. The first directors are:—Charles Mahe de Chenal de la Bourdonnais, Prince de Mahe (permanent governing director), Loventor Manor, near Totnes, Devon; John B. D. Mahe de Chenal de la Bourdonnais, Prince John de Mahe, Loventor Manor, near Totnes, Devon. Solicitors: Johnson, Weatherall, Sturt and Hardy, 7, King's Bench Walk, Temple, E.C.4. Registered office: 68, Farringdon Street, E.C.

Cablon, Ltd. (214,394).—Private company. Registered June 16th. Capital, £2,000 in £1 shares. Objects: To buy, manufacture, import, export and deal in and generally to exploit and promote the manufacture and use of super-high-tension cables, high and low tension cables and cables of all kinds, wires, switches, fuses and all other accessories, machinery, plant, apparatus, and materials of all kinds used in connection with electricity or in the electrical or other kindred trades, &c. The subscribers (each with one share) are:—F. E. Smith, 4, Langford Place, N.W.8, solicitor; H. E. Callow, 1, Edward Avenue, Morden, managing clerk. The first directors are to be appointed by the subscribers. Qualification, £1. Remuneration as fixed by the company. Solicitors: Freshfields, Leese and Munns, 31, Old Jewry, E.C.2. Registered office: Lincoln House, 296-302, High Holborn, W.C.1.

Crosland, Ltd. (214,364).—Private company. Registered June 14th. Capital, £2,000 in £1 shares. Objects: To carry on the business of wholesale dealers in electrical, mechanical and motor goods, motor, mechanical, electrical and general engineers, machinists, smiths, cleaners, fitters, &c. The first directors are:—M. A. E. Crosland, 13, Furlwell Lane, Batley, electrical engineer; W. Burnley, 1, Camden Terrace, West Park Street, Dewsbury, accountant. Qualification, £1. Secretary: W. Burnley. Solicitor: R. W. Stapleton, 24, Union Street, Dewsbury. Registered office: Russell Street, Batley, Yorks.

Cornwall Power Co., Ltd. (214,395).—Registered as a "public" company, on June 16th, with a nominal capital of £210,000 in £1 shares. The objects are to carry on in England or elsewhere the business of an electric light and power company in all its branches, and to adopt an agreement with the Urban Electric Supply Co., Ltd., for the sale to this company of all shares held by the "Urban" Company in the Cornwall Electric Power Co. Minimum cash subscription, 7 shares. The directors are:—P. D. Tuckett, 17, Durham Villas, Kensington, W.8, barrister; H. T. Crosthwaite, Little Bowden, Pangbourne, stockbroker; H. B. Grotrian, Knolls, Leighton Buzzard, barrister; E. Charrington, Ice Wood Cottage, Limpsfield, electrical engineer; F. E. Gripper, 14, Malbrook Road, Putney, electrical engineer. Qualification, £1 or such other amount as may be fixed by the company. Remuneration as fixed by the company. Secretary: C. H. Jones, 67, Hayes Road, Bromley. Solicitors: Linklaters & Paines, 2, Bond Court, Walbrook, E.C.4. The registered office is at Broad Sanctuary Chambers, Westminster, S.W.1.

Ceag, Ltd. (214,442).—Private company. Registered June 18th. Capital, £1,000 in £1 shares. Objects: To acquire the business carried on by the "Ceag" Miners' Supply Co., Ltd., Barnsley, also to acquire the registered trade mark "Ceag," No. 346,135, and to carry on the business of manufacturers, importers and exporters of, and dealers in electrical and other safety lamps for use in mines, &c. The first directors are:—E. R. J. Plummer, Wellfield House, Barnsley; W. Plummer, "The Elms," Ashford, Middlesex. Qualification, one share. Remuneration as fixed by the company. Secretary: J. Lees. Solicitor: A. P. Williamson, 19, The Square, East Retford, Notts. Registered office: Queen's Road, Barnsley.

Yorkshire Ignition Co., Ltd. (214,464).—Private company. Registered June 18th. Capital, £1,000 in £1 shares. Objects:—To carry on the business of battery and magneto manufacturers, manufacturers of, and dealers in electrical ignition apparatus and motor accessories of all kinds, general and mechanical engineers, manufacturers of, and dealers in wireless instruments, &c. The first directors are:—L. S. Hargreaves, "Rosebank," Totley Brook Road, near Sheffield; C. O. Birtles, 264, Main Road, Darnall, Sheffield. Qualification, 150 shares. Solicitor: R. B. Grayson, 10, Figtree Lane, Sheffield.

Midland Tube Co., Ltd. (214,383).—Private company. Registered June 15th. Capital, £1,000 in £1 shares. The objects are to acquire the branch of the business of the Midland Tube and Forging Co., Ltd., relating to the manufacture and manipulation of tubes carried on at Bournbrook, Birmingham, and elsewhere, and to carry on the business of manufacturers and factors of, and dealers in metal tubes, conduit tubes for electric wiring and all kinds of apparatus, articles and accessories used in connection with the erection and fitting up of electrical installations, plant, and apparatus, manufacturers of, and dealers in cycles, motor carriages, and other vehicles, &c. The subscribers (each with one ordinary share) are:—J. H. Rice, 81, Oxford Road, Moseley, Birmingham, solicitor's managing clerk; G. J. Withington, "The Gables," Francis Road, Stechford, Birmingham, accountant. The first directors are to be appointed by the subscribers. No qualification required. Solicitors: Pinsent & Co., 6, Bennett's Hill, Birmingham.

H.S Electric, Ltd. (214,330).—Private company. Registered June 12th. Capital, £3,000 in 2,850 7 per cent. preference shares of £1 each and 3,000 ordinary shares of 1s. each. Objects:—To carry on the business of electrical engineers and contractors, manufacturers of, and dealers in electrical, magnetic, galvanic, and other apparatus, &c. The first directors are:—W. Holt, "Marmora," Goldieslie Road, Wylde Green, Birmingham; W. L. Sames, Ryde House, 227, Alcester Road, King's Heath, Birmingham; H. J. Fitton, "Gawsworth," Ridgeview Road, Whetstone, N.20 (director, Fitton, Smith & Co., Ltd.); and P. G. Marr, 59, Cheyne Street, Chelsea, S.W. (director of Fitton, Smith & Co., Ltd.). Messrs. Fitton, Smith & Co., Ltd., may, so long as they hold 65 per cent. of the ordinary shares, appoint all directors in excess of two, one of whom shall be chairman. Qualification of directors (except such nominees), 100 ordinary shares. Remuneration as fixed by the company. Registered office: 32, Charlotte Street, Birmingham.

Official Returns of Electrical Companies.

British Mica Co., Ltd. (72,187).—Capital, £5,000 in 2,000 preference and 3,000 ordinary shares of £1 each. Return dated June 10th, 1926. 885 preference and 2,194 ordinary shares taken up. £1,079 paid on 885 preference and 194 ordinary shares. £2,000 considered as paid on 2,000 ordinary shares. Mortgages and charges, £2,300 debentures and £650 mortgage.

F. W. Bland & Co., Ltd.—Particulars filed of £100 debentures authorised by resolutions of May 3rd and June 7th, 1926, charged on the company's property, present and future, including uncalled capital, the whole amount being now issued.

Napier-Kimber, Ltd.—S. H. Gillett, of 24, Basinghall Street, E.C.2, ceased to act as receiver or manager on June 9th, 1926.

Acme Production Co., Ltd.—T. G. Weavers, of 4, Drapers Gardens, E.C.2, was appointed receiver and manager on June 8th, 1926, under powers contained in mortgage debenture dated April 10th, 1924.

Reflex Radio Co., Ltd.—F. Davies, of 245, Kingsland Road, E.2, ceased to act as receiver or manager on May 27th, 1926.

C. J. Thursfield & Co., Ltd.—Satisfaction to the extent of £3,000 on June 7th, 1926, of debentures dated April 1st, 1912, securing £4,000.

L. Weekes, Ltd. (old company).—B. T. Crew, of George Street West, Luton, C.A., ceased to act as receiver or manager on May 31st, 1926.

Electrical Trading Association, Ltd. (formerly Nottingham Electrical Contractors' Trading Association) (208,897).—Capital, £1,000 in £1 shares. Return dated February 19th, 1926. 1,000 shares taken up. £1,000 paid. Mortgages and charges at date of return, nil. Since registered, debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated June 7th, 1926, to secure all moneys due or to become due from the company to Barclay's Bank, Ltd.

Contraflo Engineering Co., Ltd. (110,264).—Capital, 80,000 in £1 shares. Return dated February 5th, 1926. All shares taken up. 29,450 paid (being 7s. per share on 27,000 ordinary). £53,000 considered as paid on 53,000 shares. Mortgages and charges, nil.

H. J. Cash & Co., Ltd. (79,701).—Capital, £25,000 in £1 shares. Return dated March 9th, 1926. 15,000 shares taken up. £10,000 paid. £5,000 considered as paid. Mortgages and charges, nil.

City Notes.

Reports and Meetings of Electrical Companies, Dividend Results, &c.

Brush Electrical Engineering Co., Ltd.

The annual meeting was held on June 14th last, Mr. E. Garcke presiding. In proposing the adoption of the report, the chairman said that the total credits for the past year were £155,227, or about £1,000 more than in the preceding year. The total debits were £100,618, about £5,200 less. The proposed dividend of 10 per cent. on the shares, amounting to £45,856 less tax, was the same as they had distributed for each of the three preceding years; and there was a surplus of £8,751. The orders booked and executed during the year 1925 were larger in the aggregate than in the year 1924; moreover, they began the present year with a larger order list, so that the total volume of work done and in view was satisfactory. Their policy of confining themselves to definitely established types of manufacture continued to be justified. The popularity of the Brush-Ljungström turbo-generator grew from year to year and in the home market many installations had been completed during the year under review. There had been a decrease in the number of smaller equipments, due to the policy of the Electricity Commissioners in closing down or refusing extensions to certain of the smaller stations and compelling them to take their supply or part of it from larger stations. But during the year it had again been proved that many of those moderate-sized stations, when equipped with Brush-Ljungström plant, were able to generate their electricity at a figure lower than that at which they could purchase from the bigger stations and they were, in consequence, allowed to continue. At the same time, they had been preparing to meet the requirements for larger units. For example, they had during the year booked a contract for a set of 10,000-kW output, for St. Pancras. Their foreign market had also been increasing in a satisfactory manner and during the year installations had been completed or undertaken in India, the Malay States, South Africa, Australia and South America. In the transformer department the company had continued to make good progress throughout the year. In the foreign field their experience was that transformer prices were so keenly cut in many instances that the business was not worth while for them, so long as they were able, as they had been, to keep their shops fully occupied with moderately profitable home business. Nevertheless, they were able to keep their name well to the front in the foreign field by representative orders undertaken from time to time. Proceeding to deal with the proposed co-partnership scheme between the company and its employés, Mr. Garcke said that in the relations between labour and capital there were faults on both sides. The trade unions were organised to fight capital; the employers' associations were organised to fight labour. So long as that organised warfare continued there could be no real peace in industry. How was this deplorable state to be altered? It was no use any individual capitalist or individual worker holding up both arms between those opposing forces in the hope that, at his bidding, they would cease to fire. He would be crushed and it would be impossible to say whether by friend or foe. The time had come when on this subject they ought to be able to speak plainly without fear of giving offence. In the conferences of the two sides there was a disinclination to go to the root of the troubles. They heard many platitudes about goodwill, co-operation and mutual confidence. But the most important factor which was tacitly kept in the background was the fact that in every social problem in an old country they were buried up to the eyes in vested interests of every description, and no one could move without treading on somebody's toes, without disturbing the equanimity and balance of others. He, too, had his vested interests in electricity, and that was why he was opposing the vested interests of bureaucracy. The vested interests in the relations between labour and capital were represented by the powerful organisations on both sides which had been called into being as a consequence of large-scale production on a basis of economic doctrines devoid of moral interpretation. He had not a word to say against officials who recognised as their guiding principle the law of self-preservation. It was only a one-sided theorist who could say that the only principle in life to be observed was that of self-sacrifice for others—he had a noble and lofty text, but taken alone it had little validity and was no solution of their difficulty. On the side of the worker three things were needed—a fair reward for his labour, more security for continuous and permanent employment, and a higher status. On the side of the employer, the chief need was the removal of trade union restrictions upon increased output, so that a fuller use of toil-reducing machinery, and a more efficient and economic use of fuel energy could be made. Dealing with the company's proposals, he said that the directors did not make the mistake of presenting a cut-and-dried scheme. They met the trade unions, the federation of employers, and representatives of all the employés, both on the wages list and on the salaries list and said to them: "Here is a statement of the present position of the company and of the rights and obligations of the various parties interested in the company. If the principle of co-partnership has any value it must be capable of producing something more, something better, than the *status quo*. That something more we will call the surplus; and we will postulate as a basic principle that this surplus shall be distributed among all who have contributed to its production and we will discuss and collaborate on the details." Secondly, they said: "The employés will desire to have in addition to a fair share of the surplus also some voice in the welfare of the business which they are asked to promote. Therefore we propose to collaborate with you also on this point." The tentative scheme was the result of many discussions extending over nine or ten months, and he had every confidence that the proposed scheme would be accepted by the employés. They now asked the shareholders to say whether or no they approved the scheme in principle, or whether they wished any amendments to be made. If the meeting approved the scheme in principle, they would not be irrevocably committed to its adoption; they would refer it to a provisional Co-partnership Council. That Council would draw up a definitive scheme which would be submitted to the shareholders at a later date. Mr. W. Johnstone, in seconding the motion, remarked that from his knowledge of the employés he was convinced that they would carry out the proposed co-partnership scheme in a thoroughly loyal manner. After a short discussion, in which general approval of the proposed co-partnership scheme was voiced by the shareholders, the report was adopted.

W. T. Henley's Telegraph Works Co., Ltd.

The annual meeting was held on June 18th, Sir George Sutton, Bart., presiding. In moving the adoption of the report (*vide* our last issue, p. 924), the chairman, after referring to the death of Mr. Martin Roberts, who had been a director for 16 years, said the Tyre and Rubber Co. showed a very large increase in sales, but the year's work was not satisfactory from the profit point of view. Had there been stability in the market price of rubber that company would have shown a satisfactory profit for the year. With regard to the result of the year's work, it was the best in the long history of the company. Nearly all departments had been fully employed. The large expenditure on the works in recent years had made them capable of a large output, and the sales last year made a record. For the current year, the orders brought in were of greater value than they started the year with. Given peace in industry generally, they looked to the future with confidence. Their relations with their workpeople were excellent, but troubles in other industries had a direct detrimental influence on their business. The efficiency of their machinery and plant had been maintained at the highest level, and costs being reduced to the lowest practicable point, they were in as favourable a position as their British competitors to secure business. With regard to foreign competition, they had to meet conditions as to cost of labour and overhead charges which placed them at a disadvantage. They had done all they could to meet the difficulty, and further relief must come from an advance of labour rates in foreign cable factories and a reduction in our own taxation. Referring to the financial policy of the board, he said that, as he had told them at previous meetings, their first consideration was the stability of the undertaking, the conserving of the capital, and dividends were made subservient to that. He had said that they need not think that the dividend would never be raised because it had remained the same for several years; but that when the directors were satisfied that they could safely

raise it they would do so; and they had redeemed that promise this year. The cash available, including British Government stock, was £425,000. It was a large sum, but it fluctuated considerably in the course of a year, and was not too large to provide for all reasonable eventualities. Electrical manufacturing was continually developing new methods which made new demands for capital expenditure for new processes and machinery. There was a large carry forward, £503,000; that, of course, was in the nature of a reserve. They could transfer it to the reserve account and change a part into shares as a bonus to the shareholders without depleting their cash. They did not see any advantage in doing that. They believed the wiser course was to pay an increased dividend if they could earn it, and that was the course they had adopted this year. There could hardly be a manufacturing undertaking in the British Isles which had a stronger financial position than their business, which this year had reached 35 years of unbroken dividend record. In concluding, Sir George referred to his approaching retirement as managing director. This year, he said, he had completed 45 years of active service. He had not come to his decision to retire without mature consideration. He felt that he should not alter that decision, and that the interests of the business would be best served by his retiring from the managing directorship at the end of September next. It was the desire of the board that he should remain in the company's service as an active chairman, having his place at headquarters and keeping in touch with the company's many activities, and that he had agreed to do.—Mr. W. J. Potter seconded the motion, and the report was adopted.—Subsequently a sum of £500 was voted to each director as a special bonus on account of last year's results, and a cordial vote of thanks was accorded the chairman, directors, and staff.

Telephone Manufacturing Co., Ltd.

The annual meeting took place on June 17th. Mr. F. T. Jackson, who presided, said that the combined accounts of the subsidiary companies showed a profit of £73,822 for the year, subject to depreciation and taxation, as against £68,576 in the preceding year. The net value of the Installation Companies' properties was £315,586, from which a revenue of £124 489 was derived. The annual rentals credited to revenue account rose from £111 [illegible] to £113,629. It had to be borne in mind that the company's policy was to maintain the position as to revenue, and capital expenditure had been limited to that end. The chairman then dealt with the accounts of the parent company, which were reviewed in our last issue (p. 924), and said that their investments in the French and Belgian companies had been written out of the balance-sheet. The whole of the contingency reserve (£32,000) might not be required, in which case a portion would be available for general reserve. During 1925 the Belgian company was able to pay several thousand pounds off its past indebtedness. Very little new capital was required; the purpose of the new financial scheme was to convert their bank and bond indebtedness into capital of a permanent nature. The scheme had been approved by a very large majority, and they could now look forward to a future untrammelled by the load of debenture and interest charges which had burdened them in the past. A sum of £80,000 per annum would thus be released for working capital, or, they hoped, for dividends. The reorganisation of the capital had already had a marked effect upon the business. The orders in hand and in sight would be sufficient to cover their overhead expenses for 12 months, leaving practically the whole of the gross profit from further orders available for reserves or dividends. The factory which for three years had been too large for their limited financial resources was fully equal to turning out the greater volume of work which was now coming their way. His confidence in the future was complete. The report and accounts were adopted.

Oriental Telephone and Electric Co., Ltd.

The report of the directors for the year ended December 31st last records a net revenue of £67,017. After adding £11,889 brought forward and deducting interim dividends, there remains a balance of £55,141, out of which the final preference dividend is to be paid and a final dividend of 6 per cent., plus a bonus of 2 per cent., free of tax, on the ordinary shares, leaving £14,218 to be carried forward. The business of the Singapore branch continues to progress steadily, but there was again a loss on the Mauritius branch. The Mauritius Government has held an expert inquiry, and it is hoped that the result will be an outlet from the present impossible situation. The Bombay Telephone Co., Ltd., recorded an increase in the number of subscribers, but the results did not permit of the declaration of a dividend. Since the last report, however, considerable economies in administration have been effected. The Oriental Company has taken up Rs.6,66,150 8½-per-cent. mortgage debenture stock in the company. Other companies in which the Oriental Company is "interested" have paid the following dividends:—Madras Telephone Co., Ltd., 7 per cent., free of Indian income tax; Rangoon Telephone Co., Ltd., 8 per cent., free of Indian income tax; China and Japan Telephone & Electric Co., Ltd., 20 per cent., plus a bonus of 10 per cent., both free of tax; and Hongkong Telephone Co., Ltd., at the rate of 8 per cent. per annum for the first six months of its working. The death of the chairman, Sir George S. Gibb, is recorded, and it is stated that Sir A. H. McMahon, G.C.M.G., has joined the board as chairman. Meeting: June 29th.

Whitehall Electric Investments, Ltd.

Presiding at the annual meeting on June 17th, the Hon. Clive Pearson (chairman) said that the increased net income had permitted of the payment of a 2½-per-cent. dividend on the ordinary shares and the reduction of discount on debenture stock; within the next two years the latter item should be completely eliminated. The Cia. Chilena and the Cia. Valparaiso were maintaining good progress. In four years their sales of energy had risen from 55 to 120 millions of kWh. The 47,000-kW plant was already fully loaded, and plant with a capacity of 22,000 kW which was being installed would be in the same position shortly after its inauguration. The Santiago tramway properties had been transferred to a new subsidiary of the Chilena Company, and the net earnings had shown a moderate increase. Improvements were in hand, and the new company was also to operate the power and light distribution system in Santiago. The return in Chile to constitutional government and to a gold standard had led to improvements which would benefit traders. The net operating results of the Mexican companies had shown a considerable advance over those of 1924, although they were still below the 1922 level. The company's investments did not appear to be affected by the new Alien Law in Mexico, but further investment might be affected. In conclusion the chairman expressed his confidence in the future of the company.

Madras Electric Supply Corporation, Ltd.

Mr. James Gray (chairman) presided at the annual meeting on June 16th and in presenting the report and accounts (*vide* Elec. Rev., June 11th, p. 883), said that the results were not striking but they showed the continuation of the company's steady improvement. The 6 per cent. first mortgage debentures had been entirely redeemed out of an issue of 5½ per cent., tax-free, preference shares. The debenture sinking fund contribution had consequently been transferred to the depreciation and renewal account, which, after writing off debenture and preference share issue expenses, stood at £123,836. During the year additions had been made to sub-stations; new boilers and generating sets had been installed; and further converting plant, switchgear and cable, had been provided. Agreements had been concluded with the Madras and Southern Mahratta Railway Co. and the Madras Harbour Trust for the provision of large supplies of electricity, but some time would elapse before those supplies commenced and the company felt the benefit of them. The additions at the power station would keep the company in advance of the demand. The sanctioned capital had been exhausted and it would be necessary to increase the capital at no distant date. A dividend of 6 per cent., free of tax, had been received from the Madras Electric Tramways (1904), Ltd., but the company's receipts had been affected by motor-omnibus competition, which, however, was being countered by the tramway company's own 'bus services. The report and accounts were adopted.

United Electric Tramways of Montevideo, Ltd.

The report for the year ended March 31st last states that the operation of the tramway system for the year 1924-25 resulted in an increase of the gross receipts by £13,438 to £678,100. The profit and loss account shows a credit balance of £79,294, and to this is added £7,222 brought forward, making £86,516. Interim dividends absorbed £12,000, capital redemption allocations have been made to the extent of £10,204, and £27,223 has been provided for depreciation and renewals, and after paying the final preference dividend it is proposed to pay a dividend of 4 per cent. on the ordinary shares, leaving £9,088 to be carried forward. The passengers carried by the tramway system increased from 80,074,936 to 81,544,137, but the car miles run were reduced by 205,307 to 11,003,731. The installation of additional plant at the power house was completed during the year, and a new 3,750-kW turbo-alternator was put into service in November last. Two new sub-stations were completed, and two more are in hand. The question of an increase in fares is under consideration. The meeting is to be held to-day (Friday).

Underground Electric Railways Co. of London, Ltd.

The long-awaited scheme for the reorganisation of the share capital was published last week. The present issued capital consists of 500,000 ordinary shares of £10 each (fully paid) £5,000,000, and 1,198,980 "A" ordinary shares of 1s. each (fully paid) £59,949, making a total of £5,059,949. It is proposed that the capital shall be reorganised and increased so as to be £5,068,878 divided into 5,068,878 ordinary shares of £1 each all ranking *pari passu* and each carrying one vote on a poll at general meetings. This will be effected as follows:—(*a*) The existing 500,000 £10 ordinary shares shall be subdivided into 5,000,000 £1 ordinary shares; (*b*) Of these 3,550,000 shall be retained by the existing ordinary shareholders and the remaining 1,450,000 shall be surrendered to the company and be available for re-issue; (*c*) All the 1,198,980 issued "A" ordinary shares of 1s. each shall be surrendered to the company and consolidated into 59,949 ordinary shares of £1 each and be available for re-issue; (*d*) 8,843 new ordinary shares of £1 each and 4 new ordinary shares of 1s. each shall be created; (*e*) The 1,716 unissued "A" ordinary shares of 1s. each in the present capital and the 4 new ordinary shares of 1s. each to be created shall be consolidated into 86 ordinary shares of £1 each. In addition to re-arranging the capital the scheme will cancel the contingent certificates and thus consolidate the interests of those persons who have contingent rights in the

undertaking with the interests of the shareholders, thereby eliminating a charge, even though it may be a remote one, upon the future profits. The effect of the scheme is that the £10 ordinary shareholders are asked to sacrifice a portion of their capital rights in return for slightly increased rights in the distribution of profits and the "A" ordinary shareholders to sacrifice a portion of their rights in the distribution of profits, in order that they may in future rank, *pari passu*, with the present £10 shareholders in the distribution of capital. A comparison between the present and proposed appropriation of profits available for dividend, is as follows:—

	Proportion of Profits. Present. Per cent.	Proposed. Per cent.
To the present £10 ordinary shares ...	66.66	70.03
To the present "A" ordinary shares ...	33.33	26.02
To the contingent certificates	—	3.95

The directors are taking steps to raise the money which is required for paying off the temporary bank loan, acquiring further interests in some of the subsidiary companies, and for other capital purposes. Extraordinary meetings are to be held on July 29th for the purpose of considering the proposals and approving them if thought fit.

French Companies. The *Société d'Eclairage et Force* proposes to pay a dividend at the rate of 40 fr. per share, as compared with 50 fr. in 1924, the share capital participating being considerably greater than in the previous year.

The *Union d'Electricité* records an increase in the net profits, from 15,354,000 fr. in 1924 to 18,372,000 fr. last year. The dividend is at the rate of 20 fr. (8 per cent.) per share, as compared with 17.50 fr. in 1924.

The *Compagnie Parisienne de Distribution d'Electricité* reports gross profits of 82,388,000 fr. for 1925, as against 62,692,000 fr. in the previous year. Including the balance forward the accounts show net profits of 37,409,000 fr., permitting of the payment of a dividend of 65 fr. per share, as against 60 fr. in 1924.

The report for 1925 of the *Compagnie de Forges et Ateliers de Constructions Electriques de Jeumont*, whose financial results were recently recorded, states that, despite the economic crisis, the different departments continued to be well provided with orders, and their activity was greater than in the preceding year. At the end of 1925 the manufactures still to be invoiced represented a value of over 100,000,000 fr. The various subsidiary companies in France, Belgium, and other countries also yielded satisfactory results.

Norwegian Company. The *Norske A.S. for Elektrokemisk Industri*, reporting on the year ended March 31st, 1926, states that the business made satisfactory progress in the individual departments. On the other hand, the situation of the exchange had an adverse effect. The chief receipts are paid direct in gold values, and these receipts, converted into Norwegian kronen, declined in accordance with the rise in the value of the krone. It is proposed to apply the surplus of 25,000 kr. for 1925 and the reserve fund of 236,000 kr. for the purpose of writing down investments upon which a loss has been incurred. The electrode branch still occupies the first place in the business; 11 new licences have been granted for the use of the Soderberg electrode so that contracts have now been entered into with 51 works. Contracts on a larger scale have been concluded with aluminium works for the introduction of electrodes, this branch having so far progressed as to have become quite an international business. Among the participations reference is made to the A.S. Kinsarvik, whose shares held by the Elektrokemisk Industri are now being disposed of to the Aluminium Company of America.

Swedish Company. — The *Svenska Akkumulatoraktiebolaget Jungner* reports a net profit of 201,000 kr. for the last financial year, as compared with 137,000 kr. in 1924. The directors proposed a dividend of 3 per cent. on the ordinary shares, as against 6 per cent., and 14 per cent. on the preference shares, as compared with 11 per cent.

Swiss Company.—The directors of *Brown, Boveri and Company*, Baden, recommend an increase in the dividend from 6 per cent. for 1924 to 7 per cent. for last year.

Czecho-Slovakian Company.—The *Krizik Electrical Engineering Co.*, of Prague, reports a net profit of 7,799,720 crowns for last year and is declaring a dividend of 5 per cent.

Burndept Wireless, Ltd.—The company's first report, covering 10 months ended December 31st last, states that the "slump" which was experienced prevented the company from maintaining or increasing its turnover, and in spite of the exercise of drastic economies, which were too late to affect the period under review, there was a loss of £3,563, and therefore no dividend can be paid. In February the directors entered into negotiations for the amalgamation of the company with two other leading radio and electrical companies, but the general strike intervened and the necessary financial support was not forthcoming, and negotiations were discontinued. Lord Lurgan and Mr. G. E. Duveen have resigned from the board, and Messrs. J. B. Close, H. T'Anson Jones, and C. F. Trippe have joined it. Sir C. G. C. Hamilton has been elected chairman. Meeting: July 16th.

Sevenoaks and District Electricity Co., Ltd.—After providing for depreciation (£3,500) and paying the interim preference dividend there is a net profit of £3,529. It is proposed to pay the final preference dividend, one of 7 per cent. on the ordinary shares, and to write off £1,639 against development account, &c., leaving £821 to be carried forward. During the year further capital was raised by an issue of preference shares; this has been used principally in the extension of the company's mains. Further extensions are necessary, and proposals for raising the additional capital required were to be placed before the shareholders at the annual meeting on Wednesday last.

Globe Telegraph and Trust Co., Ltd.—The directors' report for the year ended May 31st shows a net revenue of £337,110, to which is added £51,222 brought forward, making £388,332. From this amount £15,000 has been transferred to the reserve for contingencies and interim dividends absorbed £241,756, leaving £131,576, which is to be distributed as follows:—Final dividend on the preference shares and 5s. per share on the ordinary shares, free of tax, making 10 per cent., tax-free, for the year, leaving £80,991 to be carried forward. The report records the retirement of Sir Robert M. Kindersley from the board and the appointment of the Hon. A. G. V. Peel in his place. The meeting was held on Tuesday last.

Edmundsons' Electricity Corporation, Ltd.—The net profit for the past year, after providing for debenture charges and taxation, amounts to £84,431, as against £74,784 in the preceding year. To this is added £15,159 brought forward, making £99,590. After paying interim dividends there remains a balance of £73,590, which it is proposed to allocate as follows:—To reserve account, £20,000; final preference dividend, £14,000; final dividend of 5 per cent. on the ordinary shares (making 8 per cent. for the year), £20,000; carried forward, £19,590. The meeting was held on Wednesday last.

Ransomes, Sims & Jefferies, Ltd.—The profit balance for the past year, including £56,630 brought forward, is £144,599. From this £25,000 is put to a special reserve against strike losses, £25,000 is transferred to the ordinary reserve, and a dividend of 5 per cent. is to be paid on the ordinary shares, leaving £58,599 to be carried forward.

Stock Exchange Notices.—The undermentioned have been ordered to be officially quoted:—

Madras Electric Supply Corporation.—23,600 5½ per cent. (free of income-tax) preference shares of £1 each fully paid, Nos. 300,201 to 326,800 (cumulative).

Reading Electric Supply Co.—£150,000 6 per cent. first mortgage debenture stock.

James Keith & Blackman Co., Ltd.—The report for the year ended March 31st last records an increase in the volume of orders received. The available balance is £31,272, out of which it is proposed to pay a dividend of 10 per cent. on the ordinary shares, to transfer £5,000 to reserve, and to carry forward £10,272. The meeting is to be held to-day (Friday).

British Columbia Telephone Co.—The available balance from the past year's working was $738,302, as against $667,688 in the preceding year. A total dividend of 8 per cent. has again been paid on the ordinary shares, $50 000 is contributed to the pension fund, $80,000 to fire and loss reserve, and $83,387 is carried to surplus.

Para Telephone Co., Ltd.—The profit for the past year was £4,570, and the addition of £6,454 brought forward makes £11,024 available. A dividend of 3 per cent. is to be paid (against *nil* for 1924), £5,000 is allocated to depreciation, and £3,924 is carried forward.

John Brown & Co., Ltd.—The directors consider it inadvisable to pay an ordinary dividend out of the disposable profit of £279,683. They are accordingly paying the final preference dividend and carrying forward £192,183. The previous year's ordinary dividend was 5 per cent.

Reduction of Capital.—DICTOGRAPH TELEPHONES, LTD., AND REDUCED.—A petition for the confirmation of the reduction of the capital of the above-named company from £80,000 to £61,000, has been presented to High Court and will be heard in London on June 25th.

Cape Asbestos Co., Ltd.—The profit for 1925 was £26,485, and the addition of £6,237 brought forward makes £32,722. It is proposed to pay 10 per cent. on the ordinary shares and a further dividend equal to the ordinary dividend on the preference shares. £10,491 is carried forward.

Richard Johnson, Clapham & Morris, Ltd.—Out of a net profit of £5,262, plus £8,080 brought forward, making £13,342, the directors propose to pay the preference dividend and to carry forward £8,199. Meeting: June 26th.

Edgar Allen & Co., Ltd.—The directors propose to pay a dividend of 1s. per share, free of tax, on the ordinary shares out of the profit and amount brought forward, totalling £70,775.

Northern Mexico Power and Development Co.—A preference dividend of 1¾ per cent. has been declared in respect of the current quarter.

Eastern Extension, Australasia and China Telegraph Co., Ltd.—A quarterly dividend at the rate of 10 per cent. per annum has been declared.

International Light and Power Co., Ltd.—A dividend of 3 per cent. has been declared on the preference shares in respect of the half-year ending June 30th.

Stocks and Shares.

MONDAY EVENING.

THE principal feature this week in the markets for electricity companies' shares is the publication of a scheme dealing with the Underground Electric Railways of London. Readers of these notes have probably grown weary of the constant references made over the past half decade to the anticipations of the finances of this company being taken in hand in an endeavour to unify the diverse interests which prevail. When the American exchange stood so much against this country, it was impossible for anything to be done, owing to the fact that the company's income bonds are redeemable at par, payable in American as well as in other currency. Coupons, it will be recalled, became saleable at a premium, and were, indeed, so negotiable until fairly lately. Now that the American exchange is practicaliy normal, the Underground Electric Railways of London board is able to approach the matter without being handicapped by this factor.

A plan has been evolved, which is to be submitted to the proprietors at a meeting next week, whereby the £10 ordinary, the "A" shares and the contingent certificates will be brought into something like line. Keen criticism has already arisen from holders of the "A" shares and market disappointment with the terms is reflected in the sharp fall in prices. The board has not yet announced what it intends to do in regard to the 6 per cent. income bonds, the price of which remains at 101. It is hoped that the directors' statement will include an estimate of what prospect there is for an early payment of dividend on the shares. The £10 at 3¼ are 10s. down, while the 1s. shares, which were 12s. 6d. about ten days ago, have reverted to half a guinea. Districts are better at 54, on the contention that the stock looks reasonably-priced when compared with the current quotations for Underground shares. Metropolitan Consolidated at 65 is ¼ higher.

The electricity supply market is inclined to be better. Rises have occurred in City of London ordinary and preference. Countys are 1s. up. Edmundsons both gained 1s. and Notting Hill preference rose 10s., to their par price of £10. The demand for stocks and shares in every part of the House continues to be on a large scale, and any security which offers good value is eagerly taken. Jobbers state that stock is not allowed to remain long on their books. New issues are subscribed with remarkable facility.

There is about £5,000 6 per cent. first debenture stock of the Lancashire United Transport & Power Company which can be obtained at 92. This represents a discount of 1 per cent. on the issue price of 93. A partial payment of interest is due in January next. On the present price the yield comes to 6½ per cent. on the money. The amount required for interest annually is £15,000, and last year's available profits were £43,000. No dividends have yet been paid on the shares, of which there are issued 193,000 ordinary of £1 each fully paid, and which at present are worth very little.

Cable stocks and shares are again better, the Eastern group leading the way. With the exception of Great Northern Telegraphs, which are down 10s., the whole of the list shows improvement. Easterns are up to 182½, Eastern Extensions to 18½. Westerns are still relatively the cheapest of the group, and stands at 17¾. Anglo-Argentine preferred continues to improve, advancing to 104½. Oriental Telephones are better at 45s., on the issue of the report.

United River Plate hold their rise at 8. Expectation, of course, is looking for an issue of new shares at some price that will provide a bonus. It may be well not to build too much hope upon this at present, as the new issue is hardly likely to be made before the autumn. Before then, it is likely that the Telephone Manufacturing Company may place 10s. shares on the market. In fact, the possibility of an issue of this sort being made, comes within the near future. Marconis are quiet. Burndepts have fallen, owing to the issue of a disappointing report.

Mexican stocks and shares of all kinds are better, on the statement that the Mexican Government is going to pay some of the coupons due on July 1st. This confirms the nebulous impressions that have been afloat for the past few weeks, and to which reference has already been made here. Mexican Light & Power, and the Mexico Tramways issues are all better. Amongst other dollar stocks, Shawinigan Water receded to 200. Submarine Cables Trust gained 5 points to 265.

Prices of manufacturing firms are firm, with rises in British Aluminium, Callenders, General Electric preference and Telegraph Constructions. On the other hand, Metropolitan-Vickers ordinary at 23s. 9d. and Babcocks at 51s. show declines. The dragging out of the coal dispute is making its influence felt in certain directions, though nothing like the extent to which it might have been expected to do. Business throughout the Stock Exchange is fairly active. There is a good deal going on in speculative investment stocks, while the prices of sound securities continue steadily to mount. Rubber shares have enjoyed a spurt, although the price of the raw produce remains about 1s. 9d. per lb.

Southern Counties Electric Light & Power Supply, Ltd., is circularising with prospectuses of 8½ per cent. preference shares, ordinary shares and first mortgage debentures. The chairman of the company is Sir Charles B. H. Soame, Bart. Readers of the ELECTRICAL REVIEW probably require no reminder that this is a company whose issues are best left severely alone.

Share List of Electrical Companies.

HOME ELECTRICITY COMPANIES.

	Nom. £	Dividend. 1924	Dividend. 1925.	Price June 21 1926.	Rise or fall.	Yield. p.c.
Bournemouth and Poole	1	14	14	57/6	—	4 17 5
Brompton Ordinary	1	10	10	31/9	—	*6 6 1
Charing Cross Ordinary	1	15	15	45/9	—	6 10 10
do. do. 4½ Pref. ...	1	4½	4½	17/-	—	5 5 11
Chelsea	1	12	12	2	—	6 0 0
City of London	1	15	15	49/6	+2/6	6 1 3
do. do. 6% Pref.	1	6	6	22/6	+6d.	5 6 8
Clyde Valley	1	8	8	27/-	—	5 18 6
County of London	1	15	15	58/3	—	5 3 3
do. do. 6 % Pref.	1	6	6	22/6	—	5 6 8
Edmundson's Ordinary	1	7	7	24/6	+1/-	5 14 2
do. 7% Pref.	1		7	23/-	+6d.	6 1 9
Elec. Supply Corporation	1	10	10	31/3	—	6 8 0
Kensington Ordinary	5	15	15	13½	—	5 9 1
Lancs. Light and Power	1	7½	7½	24/6	—	6 2 5
London Electric	1	10	10	32/6	—	6 3 1
do. do. 6% Pref.	5	6	6	5 7/8	—	5 10 8
Metropolitan	1	11	11	37/-	—	5 18 11
do. 4½% Pref.	1	4½	4½	17/-	—	5 5 11
Midland Counties	1	5½	6	21/-	—	5 13 1
Newcastle-on-Tyne Ordinary ...	1	7	7	22/-	—	6 7 3
do. 5% Pref. ...	1	5	5	18/-	—	5 11 1
do. 7% Pref. ...	1	7	7	24/-	—	5 16 8
Notting Hill 6% Pref.	10	6	6	10	+½	6 0 0
North Met. Elec. 6% Pref.... ...	1	6	6	22/-	—	5 9 1
St. James' and Pall Mall	5	17½	17½	16½	—	5 8 6
South London...	1	15	15	2½	—	6 0 0
South Metropolitan Pref.	1	7	7	26/3	—	5 6 8
Urban Ordinary	1	4	7	1 1/8	—	6 11 9
do. 6% Pref.	1	6	6	1	—	6 0 0
Westminster Ordinary	1	15	15	44/6	—	6 16 0
Whitehall Elec. Invst. 7½% Pref....	1	7½	7½	20/3	—	7 8 0
Yorkshire Elec.	1	8	8	27/-	—	5 18 6

HOME RAILS.

Central London Ord. Assented ...	Stock	4	4	60	—	5 15 11
Metropolitan	,,	5	5	65	+½	7 13 10
do. District	,,	3½	3½	54	+1	6 9 8
Underground Electric Ordinary ...	10	Nil	Nil	3½	—¼	Nil
do. do. "A" ...	1/-	Nil	Nil	10/6	—1/8	Nil
do. do. Income ...	Bonds	6	6	101	—	*5 18 10

TELEGRAPHS AND TELEPHONES

		Dividend. 1924	Dividend. 1925.			
Anglo-Am. Tel. Pref.	Stock	6	6	104½	+½	5 14 10
do. Def.	,,	1½	1½	24½	+½	6 8 9
Automatic Telephone	1	3	3	2½	—	4 0 0
Chili Telephone	5	6	5	6¾	—	*3 12 9
Cuba Sub. Ord.	10	5	5	6 3/4xd	—	7 8 2
Eastern Extension	10	10	10	18½	+½	*5 9 7
Eastern Tel. Ord.	Stock	10	10	189½	+1½	*5 9 7
Globe Tel. and T. Ord.	10	10	10	18¾	—	*5 9 7
do. do. Pref.	10	6	6	11	—	5 9 1
Great Northern Tel.	10	22	20	37½	—½	7 5 6
Indo-European	25	8½	10	45½	—	*5 10 0
Marconi...	1	10	10	1 1/8	—	8 8 10
Marconi Marine	1	10	7½	21/3	—	7 1 2
Oriental Telephone Ord.	1	12	12	45/-	+1/3	*5 6 8
United R. Plate Tel....	5	8	8	8xd	—	*5 0 0
Western Telegraph	10	10	10	17¾	+¼	*5 13 6

HOME AND FOREIGN TRAMS, &c.

Anglo-Arg. Trams First Pref. ...	5	5½	5½	8½	—	8 16 0
do. do. 2nd Pref. ...	5	6	6	9⅝	—	10 8 8
do. do. 5% Deb. ...	Stock	5	5	71½	—	6 19 10
British Electric Traction Ord. ...	,,	7	8	143	+8½	5 12 0
do. do. 6% Pref. ...	,,	6	6	112	+1	5 7 1
Brazil Traction	100	4	5	109	—	4 19 6
Brit. Columbia Elec. Rly. Pcs. ...	Stock	5	5	86½	—	5 17 0
do. do. Preferred ...	,,	90/-	126/9	105 1/4xd	—	*6 0 2
do. do. Deferred ...	,,	129/6	8	127xd	—	*6 6 0
do. do. Deb. ...	,,	4½	4½	77	+1	5 10 5
London & Sub. Trac. 5% Pref. ...	1	2½	Nil	6/-	—	Nil
London United Tram. Deb. ...	Stock	4	4	49	—	8 3 4
Mexico Trams 5% Bonds	—	5	5	73½	+4	7 4
Mexican Light Common	100	Nil	Nil	3¾	—	Nil
do. Pref.	100	Nil	Nil	7⅝	+2	Nil
do. 1st Bonds	—	5	5	71½	—	6 19 10
Yorkshire (West Riding)	1	5	—	14/-	—	7 2 10

MANUFACTURING COMPANIES.

Babcock & Wilcox	1	12	14	51/-	—1/-	*5 2 0
British Aluminium Ord.	1	5	10	46/-	+1/-	4 6 11
British Elec. Transformer Pref. ...	1	Nil	7	18/9	—	7 9 4
British Insulated Ord.	1	15	15	3⅝	—	4 10 9
Brush Ord.	1	10	10	27/-	—	7 5 6
Callenders	1	15	15	4 7/8	+1/9	3 11 9
do. 6½% Pref....	1	6½	6½	28/9	—	5 9 5
Crompton Ord.	1	Nil	Nil	15/-	—	... ...
Edison-Swan	£/-	10	10	9/9	—6d.	4 2 0
do. 5% Deb.	Stock	5	5	84/-	—½	5 19 1
Electric Construction	1	10	10	32/6	—	6 3 0
Enfield Cable, Pref.	1	7½	7½	1½	—	6 0 0
English Electric	1	5	Nil	16/3	—	... ...
do. do. Pref.	1	6	6	19/-	—	6 6 4
Gen. Elec. Pref.	1	6½	6½	23/-	+6d.	5 13 1
,, Ord.	1	5	7½	30/3	—	4 19 2
Henley	1	16	20	4	—	5 0 0
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber...	1	5	5	23/-	—	*4 6 11
Johnson & Phillips	1	10	17½	3½	—	5 15 8
Met.-Vickers Ord.	1	8	8	23/9	—1/9	6 14 9
do. Pref.	2	8	8	2½	—	6 8 0
Siemens Ord.	1	7½	7½	28/- xd	—	5 4 4
Telegraph Construction	12	20	10	28½	+½	*4 5 0

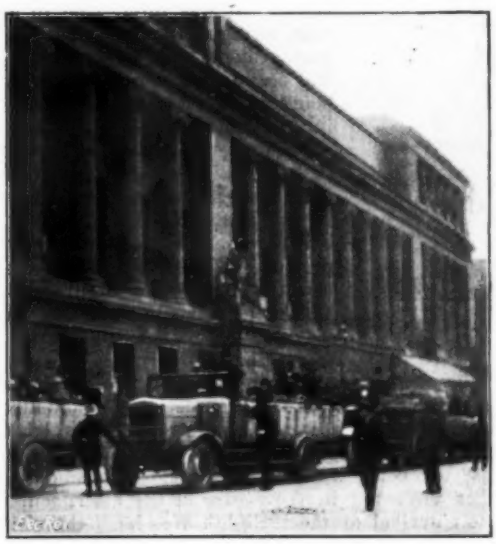
*Dividends paid free of Income Tax.

The Incorporated Municipal Electrical Association.

Annual Convention at Glasgow.

(*Continued from page* 927.)

In spite of the adverse conditions that prevailed, the Convention opened with every indication of success. There was a large attendance at St. Andrew's Halls on Monday evening, June 14th, to meet the President and Dr. D. McK. Dewar, and an enjoyable evening was spent in an informal fashion. Besides music and dancing, there was a very good display of kinema films, organised by the E.D.A., which attracted an interested "audience."

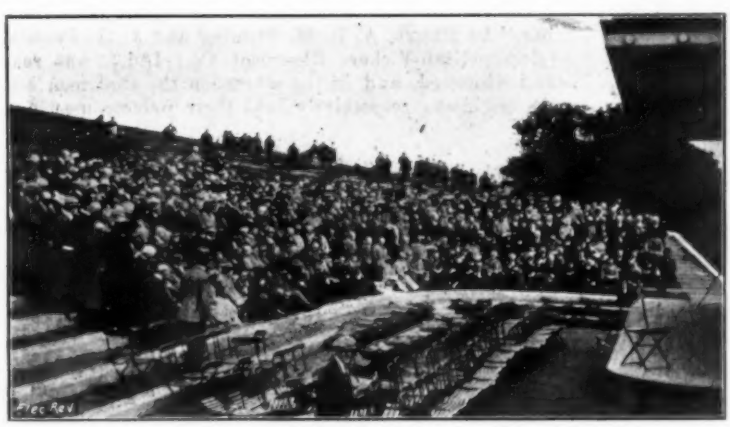


Starting from St. Andrew's Halls for Alexandra Park.

The Ladies "entraining" for the Electrical Exhibition.

At the formal opening of the Convention on Tuesday morning, the Lord Provost, Sir Matthew W. Montgomery, in welcoming the members on their third visit to Glasgow, emphasised the importance of cheapening the price of electricity as the main factor of successful development; in Glasgow, he said, electricity was as cheap as anywhere else, or cheaper, but they must endeavour to reduce the price still further. Referring to the Electricity (Supply) Bill, 1926, he asked whether it would have that effect; if so, he would welcome the Bill, but he thought Glasgow was big enough to look after its own electricity supply, and he expressed the hope that nothing would be done which would in any way interfere with the expansion of the Corporation's electrical undertaking. He referred in eulogistic terms to the high merits of the City electrical engineer, Mr. R. B. Mitchell, who thanked the Lord Provost for his words of welcome to the I.M.E.A., and afterwards delivered his presidential address, an abstract of which appeared last week.

Mr. S. E. Britton, M.I.E.E. (Chester), then read his paper on "Supplies to Outlying Districts," in abstract, and after the discussion, which is reported on pp. 973-4, the members assembled in the Grand Hall, where they were entertained to luncheon by the Lord Provost, Conveners, and members of the Electricity Committee of the Glasgow Corporation. After the loyal toast had been honoured, the toast of "The Corporation of the City of Glasgow" was proposed in a humorous speech by Ald. E. Huntsman, chairman of the Nottingham Electricity Committee, and was responded to by the Lord Provost.



Photographing the "Group" in the Park.

The President and Mr. A. W. Blake at Dalmarnock.

From the Hall the members were conveyed to Alexandra Park in a procession of charabancs so lengthy that it occasioned a considerable sensation in passing through the heart of the city to the east end; the traffic,

however, was admirably handled by the police, whose methods were observed with interest. In the park a group was formed on the terraced slope in front of the bandstand, and several photographs were taken, the process occupying considerable time owing to the painstaking care of the artist. A move was then made to the Dalmarnock power station of the Corporation, over which the visitors were conducted by members of the staff. Some particulars of this fine station will be found in our last issue; it has now, with the recent extensions, a maximum continuous capacity of 131,250 kW, and a maximum overload capacity of 147,000 kW, the ultimate capacity contemplated being 200,000 kW.

Some Members of the I.M.E.A. at Gleneagles Hotel.

The boiler-house efficiency is about 78.5 per cent., that of the turbine house 23.7 per cent., and that of the whole station 18.3 per cent. on the basis of generated energy. The best daily efficiency recorded is 20.5 per cent., and the estimated overall efficiency of the plant in the new section of the station is 22.5 per cent. The maximum load on the station last winter was about 90,000 kW, and the demand applied for is over 230,000 kW. The output in 1925 was 220 million kWh. The plant was inspected with great interest, and the leading particulars were imparted to the visitors in the form of an admirably produced souvenir brochure.

One of the new Parsons turbo-alternators gave, on test, the following results for steam consumption:—

18,750 kW, 9.609 lb. per kWh,
15,000 kW, 9.215 lb. per kWh,
11,250 kW, 9.444 lb. per kWh,

the true mean for the three loads mentioned being 9.379 lb.; the guaranteed figure was 9.73 lb., upon which a notable improvement has therefore been made. At 21,000 kW the consumption was 9.803 lb.

In the evening the Lord Provost and magistrates held a reception in the magnificent salons of the City Chambers. There was a large attendance, and a very happy evening was spent, the entertainment including music and dancing, and an excellent concert rendered by Mr. Thorpe Davie's choir. The dancing of the reel was watched with great enjoyment, especially by the many members of the "subject race south of the Border" who were present, and the hospitality of the Corporation was thoroughly appreciated, although, in accordance with the self-denying ordinance recently adopted by that body, all municipal functions are "dry."

On Wednesday the first business was the reading and discussion of a paper on "Operating Costs of Electric Battery Vehicles," by Mr. C. W. Marshall (Glasgow), which is abstracted on a later page. A number of the electric vehicles used by the Glasgow Corporation were paraded outside the Hall at the end of the meeting.

In the afternoon an early start was made by special train to the Renfrew works of Messrs. Babcock and Wilcox, Ltd.; the weather conditions were very unpleasant, but did not prevent the visitors from enjoying the tour through this huge establishment, which occupies nearly 100 acres. It was interesting to learn that, owing to the forethought of the management, the factory had not had occasion to shorten the working hours or restrict its operations during the shortage of coal; the boilers, air-heaters, superheaters, conveyors, and cranes in course of manufacture were inspected with great interest. It was noticeable that many of the boilers were designed for very high pressures, with shells $1\frac{3}{4}$ inches in thickness, and the accuracy with which the parts were made was a marked feature of the work, the large rings being turned all over.

The projected steamer trip in the Firth of Clyde being impracticable owing to fuel restrictions, an admirable alternative was found in a visit to Gleneagles, whither the members were conveyed in two special L.M. & S. trains, tea being served *en route*. Fortunately the weather improved in the course of the afternoon, and on their arrival at the "Eighth Wonder" the visitors were able to enjoy a round on the famous golf links or to walk to points whence the splendid views of the mountains and the beautiful country surrounding the hotel could be enjoyed. Dinner was served in the ball room of the hotel, at the invitation of Messrs. Babcock and Wilcox, Ltd., and the President took the opportunity of expressing the members' appreciation of the lavish hospitality of that Company; Sir James Kemnal, to whom a hearty vote of thanks was accorded, with musical honours, briefly acknowledged the compliment.

On Thursday morning a paper on "Industrial Heating," by Messrs. A. P. M. Fleming and J. H. Crossley (Metropolitan-Vickers Electrical Co., Ltd.), was read and discussed, and in the afternoon the chairmen and the engineers respectively held their private meetings.

The Rainy Day, at Renfrew.

The B. & W. Boiler Works, Renfrew.

A special meeting for women, arranged by the I.M.E.A. in collaboration with the Electrical Association for Women, also took place in the afternoon, at which Dr. Christina Barrowman delivered a lecture on "The Remedial Uses of Electricity," with interesting demonstrations; afterwards a move was made to the Electrical Exhibition, where tea was served.

(To be concluded.)

Electricity Supply to Outlying Districts.

By S. E. BRITTON.—*Abstract.*

(*Concluded from page 930.*)

For the present purpose it is assumed that transmission at 6,600 volts can economically serve thinly-populated areas having a radius of about six miles, say 120 square miles, and proportionately smaller areas depending on the magnitude of the demand, and that the largest areas which can be dealt with at higher pressures are as follows:—

11,000 volts, radius of 10 miles, say 300 square miles.
22,000 volts, radius of 20 miles, say 1,250 square miles.
33,000 volts, radius of 30 miles, say 2,800 square miles.

The demand for low-voltage electricity in rural areas is unlikely to exceed the capacity of low-pressure sub-stations equipped with 100-kVA transformers, except in rare cases.

Individual demands of 50 kVA and upwards can usually be most cheaply supplied by taking the high-voltage supply to the consumer. Several tables are incorporated in the paper giving the comparative costs of various components of a rural supply system, to meet specified conditions.

Table 1 shows that the cost of an indoor sub-station of 100 kVA ranges from £525 for 6,600/440 V to £1,250 for 33,000/440 V; the outdoor type similarly costs from £225 to £460.

Table 2, relating to a 0.1-sq. inch line, shows that underground cables laid and buried cost from £2,000 per mile at 6,600 V, to £3,300 at 33,000 V. Overhead lines for the same conditions cost from £965 to £990, with wooden poles.

Table 3, for low-pressure 4-wire distributors, covers the range from 3×0.035+1×0.029 sq. inch overhead conductors, at £550 per mile, to 3×0.082+1×0.042, costing £685; underground cables of similar capacities cost about twice as much.

Table 4 relates to low-pressure 2-wire service lines of various lengths and sizes. A 40-foot service, 0.0225 sq. in., costs 105s. underground, whilst an overhead service of 0.020 sq. in. costs 62s.

Table 5 compares complete transmission systems, including 100-kVA sub-stations three miles apart, for 100 consumers, with six miles of 4-wire low-pressure distribution, at transmission voltages of 6,600, 11,000, 22,000, and 33,000 volts. Data are given for underground cables with indoor sub-stations, and for overhead lines with outdoor sub-stations, using steel poles or wooden poles. In the case of underground cables of 0.04 sq. in., the average cost per inch at 6,600 V is £2,103; at 11,000 V, £2,258; at 22,000 V, £3,328; at 33,000 V, £3,628. With overhead lines, using steel poles, the conductor section being 0.035 sq. in., the average cost per mile at 6,600 V is £1,124, increasing to £1,185 at 33,000 V; with wooden poles the figures are £1,073 and £1,175 respectively.

Table 6 (the first two sections of which are reproduced below) gives the average price per unit required to meet the charges (1) with secondary transmission and distribution by underground cables; (2) with transmission and distribution by overhead lines on wooden poles; also the percentage increase required in the income per unit to meet the charges on the underground system compared with overhead lines on wooden poles.

TABLE VI.

6,600 VOLTS SECONDARY TRANSMISSION.

AVERAGE COST PER UNIT.

	50 Units per head.	100 Units per head.	250 Units per head.	500 Units per head.
	d.	*d.*	*d.*	*d.*
Underground cables ...	3.6	2.40	1.66	1.44
Overhead wooden poles	2.362	1.771	1.432	1.316
	Per cent.	Per cent.	Per cent.	Per cent.
	52.4	36.28	15.92	9.42

11,000 VOLTS SECONDARY TRANSMISSION.

	d.	*d.*	*d.*	*d.*
Underground cables ...	3.75	2.48	1.71	1.46
Overhead wooden poles	2.371	1.786	1.434	1.317
	Per cent.	Per cent.	Per cent.	Per cent.
	58.16	38.86	19.25	10.86

The problem of supplying outlying districts therefore resolves itself into preparing a scheme, the cost of which can be met by the inhabitants of a particular village, or thoroughfare, or individual. A convenient method of allocating the revenue required from those who are to be supplied from the distributors of a single sub-station is to distribute equally the amount of income required to the total assessable value of the premises to be supplied, and then determine to what extent the inhabitants of the particular locality can afford to pay for the service it is proposed to give. This can be tested by a circular letter to the occupiers of the property, accompanied by a postcard for a reply. In the Chester rural area of supply the income required varies from 6s. to 12s. for each £1 of assessable value of buildings. Electricity for lighting only is approximately no more costly than oil lamps when the cost does not exceed 8s. per £1 of assessable value.

A substantial percentage of the inhabitants in rural districts cannot be supplied at a price which would at once be remunerative to the suppliers and attractive to the supplied. The economic area of supply will, however, be automatically enlarged when electrical legislation and the rules and regulations for overhead lines are amended so as to be in accordance with practical requirements, remote contingencies being left to take care of themselves. Obviously, a supply of electricity to outlying districts cannot be inaugurated and operated successfully for some time, if at all, or a cheap supply given, if the electricity is purchased and distributed in small quantities by a local authority, company, or person.

The secret of successful supply to small and scattered communities in outlying districts would appear to lie in the encouragement of existing authorised undertakers to extend their distributing systems to the widest possible limits. It is to bring about this state of affairs and to remove rules and regulations which now make it impracticable to carry electricity into many of the outlying districts, owing to the cost, that legislators should devote themselves.

If the provisions of the 1926 Bill are adopted by Parliament, private interests will acquire the territory which is not held under statutory powers by authorised undertakers. The distribution and use of electricity will, in future, make greater progress in the hands of enterprising local authorities than in those of companies and persons, especially where the local authority declares that it will not take any surplus monies from the undertaking for the relief of the rates, establishes an attractive showroom, and undertakes wiring and the supply of electrical apparatus. Consumers and prospective consumers have instinctively more confidence in, and prefer to obtain all their requirements from, a municipal authority than from a dividend-paying undertaking.

Discussion.

Mr. W. A. TURNBULL (Aylesbury) said he was supplying electricity for a distance of 10 miles around and was running three transmission lines. One line had been operating at 11,000 volts for 18 months. As to wayleaves, he did not study the legal aspect too much, but endeavoured to come to agreements with the landowners; if it was quite impossible to come to terms, then there was nothing to be done but wait until compulsory powers could be obtained. He had been able to construct lines more cheaply than was indicated in the paper; for instance, he was putting down an underground 0.075 sq. in. 11,000-volt cable at £1,323 per mile, compared with £2,300 mentioned by the author for a 0.1 sq. in. cable. He was putting up an overhead 0.075 sq. in. cable at a cost of £520 per mile, against Mr Britton's £875 for 0.1 sq. in., and there was not much saving between 0.075 and 0.1 sq. in; it was not economic, however, to go below 0.075. He had got out a design for a galvanised 7/12 steel-wire cable of 45 lb. quality, and with 400-ft. spans was putting it up for £295 per mile; it would carry 300 kW for a distance of 5 miles with a 5 per cent. drop. A better proposition, however, would be a copper-clad high-tensile steel wire, which would enable greater spans to be used, but at present it was not being manufactured in this country, although he hoped it soon would be. He warned Electricity Committees against expecting to economise on the staffs for carrying out rural schemes, because there was a great deal of work to be done in calculating the sags and stresses.

Mr. R. W. L. PHILLIPS (Bedford) said the Bedford Corporation had recently increased its electricity supply area 100-fold and he contended that such councils as his were the right people to supply the surrounding districts, in preference to the supply being given from the big "grid-iron" scheme of which so much had been heard. There was, he said, very little difficulty in getting Special Orders for giving such supplies, and his experience had been that the outside authorities much preferred to deal with a neighbouring municipality than with a power company.

Mr. R. BORLASE MATTHEWS said that 18 months ago there were 200 farmers in this country using electricity, but to-day there were over 600. There was much cheap and nasty overhead construction on the Continent, but, at the same time, the standards of this country were too high and it was only by improved design that the end in view would be accomplished; by that he meant that most of the work on the poles would have to be done in the factory so that the poles could be put up in any position on the site and reduce the cost of alignment; the cross arms and bearers should be clamped on and not drilled, so saving expense again. In connection with wayleaves, it was common practice on the Continent to have a schedule of prices. The owner of any land could call for an inquiry and, if he did so, the assessors would also assess his land in respect of betterment consequent on electricity being brought into the area. It obviously made the land more valuable so that the owner of the land had really to contribute something towards the cost of wayleaves. After carefully studying the suggested amendment of the low-voltage overhead-line regulations which the I.M.E.A. had placed before the Electricity Commissioners, he felt that they were still too drastic and that too high a standard was set, at any rate for the future if not for the present. There were too many regulations, and they ought to be left alone; there should be no necessity for submitting every calculation for approval in connection with lines of which the engineering principles had already been settled. Users in rural areas would rather put up with a little less security of continuity of supply in order that the supply should be cheap, and also would tolerate a greater voltage variation than was now allowed by the Commissioners. How did Mr. Turnbull get the cost of a pole line below £300 per mile? He, personally, knew of a line which had been approved by the Electricity Commissioners, the cost of which had been £120 per mile and he had mentioned one to Mr. Turnbull which cost £25 per mile, this low cost being possible by getting the farmers to provide the poles and labour for erecting the line, under the supervision of the electricity supply authority's staff, there being no better people for stringing an overhead line than farmers, owing to their experience in straining wire fences. This had been done in South Wales and it was common practice in America. In Sweden the usual

cost of a low-voltage line was about £100 per mile and in America, notwithstanding the higher cost of labour and material, it was usual to put up a 6,600-volt line for about £150 per mile. Where underground cables were necessary, there was a method of laying them cheaply in clay pipes by means of a machine which ploughed the soil, laid the pipe, and drew in the cable. The great point in rural electrification was to create the load; if electricity were offered at ½d. per kWh to-day, the demand would not be very great; the public must be educated how to use electricity in every possible way. In France the development of large rural areas had been found to pay eventually, and in various Continental districts there was a consumption of 5,000 kWh per mile of road in such areas, which was a paying proposition, although naturally everybody would like to increase that figure in this country.

Lieut.-Col. W. A. VIGNOLES (Grimsby), owing to the cost of making new roads, anticipated that most building in rural areas would be along the existing main roads, and that the houses would be close together. In that event, instead of overhead lines, they would have to use underground cables because the former would be unsightly; probably they would have to have a high-voltage main along each main road with transformer stations at intervals. Moreover, there would be difficulties in running overhead lines owing to the existence of Post Office wires already. In a case at Scunthorpe and Frodingham the overhead wires were stretched from gable to gable of rows of villas and it was not at all a pleasing sight. He was not at all convinced of the view stated in the paper that underground mains cost more for maintenance than overhead lines, because from the small amount of experience he had had with overhead lines this did not appear to be the case. He also gathered from the paper that if they could have less stringent regulations, the cost of constructing overhead lines would be reduced, but he could not help noticing when he was on the Continent a year or two ago, where they were told that the regulations were easy, that they were putting up steel and concrete poles where timber poles could be had almost for the asking and were of no value at all. As a matter of fact, the standard of pole construction in certain parts of the Continent was extremely high. If they were to use that type of construction, the cost of maintenance would be very considerable.

Mr. R. A. CHATTOCK (Birmingham) said the hesitation of municipalities to go into rural areas was justified because of the difficulty of showing a profit, but large municipalities could afford to take a little risk in the matter and wait until development was such that it became a paying proposition. Certainly, industrial centres were more fitted to develop the rural areas around them than anybody else, but he did not think the proper means of doing it was by what had been called a "grid iron" all over the country. They should be developed by thin lines radiating out from the big centres, because such an arrangement would enable electricity to be supplied most cheaply. No reference was made in the paper to supplies at low voltage for farmhouses and similar premises. Col. Crompton had been instituting a campaign in favour of 50 or even 30 volts and it seemed to him that, whilst the wiring could be reduced in cost very materially (because such a voltage could be dealt with by bare wires cleated up anyhow) the cost of getting the electricity to the farmhouse would be very materially increased owing to the need for a very big section of cable, and in the end there would not be much difference in the cost of the kWh. Whilst d.c. might not be suitable in rural areas, it was suitable in the residential portions of larger areas.

Councillor R. DALTON (Carlisle) said Carlisle had been considering this subject carefully for two or three years and now intended to apply for an extended area to embrace all the rural areas which touched Carlisle. The great difficulty was want of commercial enterprise on the part of Electricity Committees. The first question always asked was: "Will it pay"? but municipal electricity undertakings should be a little venturesome and take a little risk.

The MAYOR of AYLESBURY spoke on similar lines, and expressed the hope that the farming population would come forward in the Aylesbury and other areas and support what was being done in this direction.

Councillor A. E. GOUGH (Cardiff) said that although Cardiff was situated in the area of a power company, the Corporation had been successful in obtaining some fringe orders. His complaint with regard to them, however, was that they took too long to get through. It was not due to the Cardiff electrical engineer that supply was not being given in the outside areas, but to difficulties with some of the members of the Council who would not agree to anything that would not show an immediate profit.

Alderman SENINGTON (Bristol) said Bristol had been making similar endeavours and, at the same time, suggested that it was not unreasonable to ask the outside areas, in certain circumstances, to pay a little higher price than that paid in the area of the supplying authority. The great point, however, was to get supplies of cheap electricity to the rural areas.

Mr. S. E. BRITTON, replying to the discussion, hoped Mr. Turnbull's cheap overhead lines would turn out to be economical, with low maintenance and reasonable continuity of supply. He, himself, had been more concerned with getting a really reliable supply and he was installing cables to meet the demands of the next few years. The very low figures that had been quoted seemed quite impossible, having regard to the figures he had before him of the cost of copper; for instance, taking three 0.1 sq. in. copper cables, copper at £70 per ton amounted to £400 per mile, which did not seem quite consistent with the figures that had been mentioned. The increased value of land when electricity suply was taken into a district was very important, and there were cases in the rural areas around Chester of farmers, who had bought land at £40 or £50 per acre for agricultural purposes, selling off the fringes at £250 per acre for building purposes. As to the cost of maintenance, the first overhead line put up by him 18 years ago, half a mile long, had not had £5 spent on it in repairs; a 6,000-volt line erected 6 years ago had not entailed the expenditure of £1, and a 33,000-volt line in use since 1921 had not had anything spent upon it except the cost of replacing three insulators. During the past three years he had put up between 50 and 60 miles of overhead lines and the cost of repairs had been between £3 and £4; the maintenance of overhead lines was not an expensive matter, and repairs could be carried out very quickly as compared with underground cables. He knew of Col. Crompton's campaign, but there was likely to be great danger in adopting such a policy because it would mean that householders would have to handle apparatus consuming a large current. For instance, at 30 volts a 500-watt electric iron would mean 10 amperes and a 3-kW radiator would mean 100 amperes; he considered the thing perfectly ridiculous and unworthy of consideration. The kWh consumed per member of household, taking different types of houses, varied from over 800 (in one case 999) to about 50, and it had been the general experience that immediately a power line was taken into the country development went on at a rapid pace and people from the outlying districts came into the town to see the showroom. The amount of money which people would thus spend upon electrical apparatus was surprising, and in a few years' time he confidently anticipated that users in the rural areas of Chester would be consuming more electricity per head than were the consumers inside the city. In connection with voltage variation, it was satisfactory to know that the Electricity Commissioners had sanctioned 8 per cent. for the Chester rural areas, as compared with the usual 4 per cent., whilst even in France the figure was 7 per cent.

Electric Battery Vehicles.

Their Operating Cost and Competition with Rival Types.

By C. W. MARSHALL.—*Abstract.*

Electric vehicles have been used in the transport services of the Glasgow Corporation Electricity Department since 1913, the experience gained in this period affording a sound base for estimating operating cost and the extent to which such vehicles can compete with rival types.

The actual types of vehicles in use range from a half-ton lorry to a ten-ton tractor, and machines of almost every available make have been tried. The working conditions have been very varied, ranging from light delivery work on good roads to refuse collection on routes with extremely bad surfaces.

The types of batteries which have been tried in Glasgow included thin- and thick-plate lead types from several makers, and nickel-iron batteries from three makers. The present position is that the lead battery is in favour, due in a great part to the fact that it is much cheaper in initial cost and at the same time gives service at least as good as that obtained from the alkaline battery. The relative merits of thin- and thick-plate lead batteries is still an open one, although the three years' guarantee now issued with the latter type has done a great deal to decide the matter in its favour. The thin-plate battery lasts only 12 to 15 months and costs about 60 per cent. of the price of the thick-plate battery, which lasts 30 to 36 months. It is, however, possible to get a much greater capacity for a given weight and volume with the thin-plate battery and so in some cases the vehicle becomes much more useful. For example, vehicles in the service of the Glasgow Corporation Cleansing Department which could only do one shift on refuse collection when fitted with thick-plate batteries can do two shifts with thin plates. When this is the case the extra cost of the battery is thoroughly justified.

It is of interest to note that an Italian firm uses extremely thin plates (.6 mm.) and gets extraordinarily high capacity per unit weight (approximately twice that obtained in a normal thin-plate battery, or two-and-a-half times that of a thick-plate battery). The life of such batteries is only about four months, but the originators of the system seem to think that the results obtained are quite satisfactory; the vehicles in this case are passenger omnibuses.

Alkaline batteries cost from two to four times as much as the best lead batteries. Although they last at least five or six years under hard service conditions, and eight or ten years under easier conditions, their low watt-hour efficiency and high internal resistance counteract the long life to some extent. There are, however, some conditions which are specially suited for alkaline batteries. The principal characteristics of the different types of batteries are summarised in Table I.

TABLE I.—BATTERY DATA.

Type of battery.	Alkaline.	Lead (thin plate).	Lead (thick plate).
Watt-hour efficiency ...	59%	75%	75%
Watt-hours per cu. in. ...	0.74	0.8	0.6
Watt-hours per pound ...	15	12	9
Initial cost (approx.) £/kWh	30	4	8
Life in years	6-8	1	3
Life in cycles of charge and discharge	1,800/2,400	300	900

The operating costs have been calculated, and are illustrated graphically in fig. 1, which shows the running cost per vehicle mile of electric lorries of 0.5 to 5-ton load capacities for varying annual mileages. To assist in reviewing the relative importance of the various items, they are arranged in descending order of magnitude in Table II for a 2-ton vehicle.

TABLE II.—ANNUAL OPERATING COSTS OF 2-TON ELECTRIC LORRY.

Item.	£	Per cent.
Driver's wages	150	34.5
Depreciation and interest ...	75	17.3
Battery renewals	34	15.9
Tires	36	7.9
Electrical energy	25	6.0
Licence	22	5.8
Garage	19	5.0
Maintenance	14	4.4
Insurance	—	3.2
Total	434	100.0

Cost of complete vehicle, £552.
Cost of battery, £208.
Cost of energy per kWh, 0.75d.

Driving a good electric vehicle is so easy that it may be considered correct policy to employ the cheapest type of labour. In the opinion of the writer it is much more satisfactory to employ a good class of men and to teach them to look after the machine in an intelligent way; if this is done, there is very little need of any other maintenance staff. The recent extension of the guarantees of lead batteries from two to three years marks an important step in the direction of reduced costs. The plain fact is, however, that users of electric vehicles must have some assurance that the supplies of batteries will be certain and that there is little danger of a serious increase in price. Tire cost is now among the primary cost items of all mechanical vehicles. The basic price of electrical energy used in these calculations is ¾d. per kW hour, but as the item represents only a small percentage of the total cost, it has very little effect on the general economic position. The electric vehicle has already been granted a concession when used by non-trading municipal departments; the annual tax under these conditions is only £6. In view of the very desirable characteristics of the "electric" from the standpoints of small road wear, this concession should be extended to all users. The electric vehicle has a great advantage in respect of maintenance, as the number of moving parts need not exceed 10 per cent. of those in a petrol vehicle.

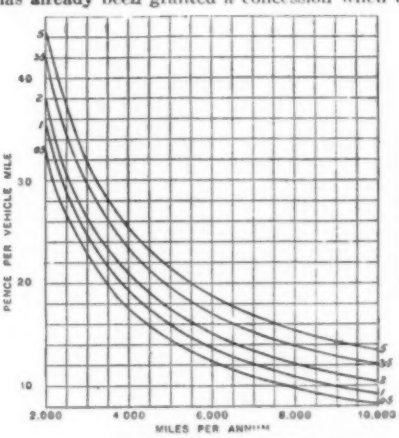


Fig. 1.—Total Cost per Vehicle Mile of Electric Lorries.

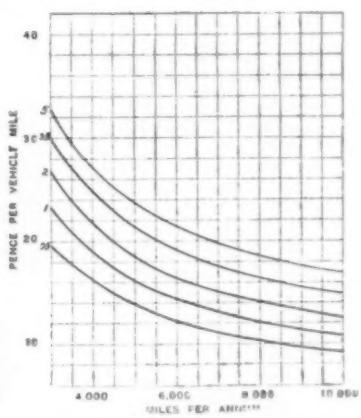


Fig. 2.—Total Cost per Vehicle Mile of Petrol Lorries.

Assuming that the available supply of electricity is at 440 volts, 3-phase, 50 cycles, the cost of battery-charging plant varies from £10 per kW at a capacity of 10 kW to £7 per kW at a capacity of 100 kW, these prices including converting plant, control gear on both the a.c. and d.c. sides, wiring, and erection. Taking 15 per cent. per annum to cover all charges on the plant, the cost is 0.124d. per kWh for the smaller and 0.087d. per kWh for the larger plant, the load factor being assumed to be 33 per cent. When, as is the case in Glasgow, vehicles which operate at night are kept in the same garage as those which operate by day, the load factor of the charging plant can easily reach 60 per cent., or more; the efficiency of the charging plant should not be less than 75 per cent. even with an output of 10 kW.

The battery vehicle should be confined to cases where the daily distances do not exceed 35 to 45 miles. The horse does not appear to be losing much ground as yet; the working cost of horse-drawn vehicles (Table V) are the lowest compatible with the use of good-class horses and vehicles

Analysis of the figures will show that the average rate of working of the horse does not exceed 0.5 kW, and that the energy expended per day is only about 4 kWh; the horse, therefore, compares very unfavourably with the battery in both power and energy capacity. The price paid for energy in this form is 9d. per kWh, taking only feeding charges into account, and if the whole of the charges directly connected with the horse are considered, the price of the kWh rises to about 1s. 6d. If the characteristics of the horse-drawn vehicle are considered to be desirable, it would be an easy matter to produce an electric vehicle which would reproduce these characteristics, but while everyone seems to be satisfied that a low-speed horse-drawn vehicle is all right, a mechanical vehicle is considered of no account if it cannot attain a speed of at least twelve miles per hour.

TABLE V.—ANNUAL OPERATING COSTS OF HORSE-DRAWN VEHICLE.

Item.	£	s.	d.
1. Driver's wages	141	5	0
2. Feeding, bedding, and stableman's wages	52	10	0
3. Rent of stables	10	0	0
4. Horse depreciation	7	10	0
5. Repairs to vehicle	7	10	0
6. Insurance	7	10	0
7. Horse shoeing	6	5	0
8. Taxes	3	3	0
9. Saddler	1	17	0
10. Veterinary surgeon	1	5	0
Total	£238	15	0

Average daily cost	16s.
Average cost per vehicle mile ...	10.7d.
Average number of hours' work per day (six days per week) ...	8 hours.
Average speed	2.75 miles/hour.
Average mileage per day	14/18 miles.
Weight of load	25 cwt.
Weight of vehicle	12.5 cwt.
Weight of harness	98 lb.
Weight of horse	16 cwt.

It appears from Table VI (annual mileage=10,000) that the real competitors are the petrol and electric vehicles for mileages and loads of the order under consideration. The table shows that half-ton and one-ton "electrics" are respectively 15 and 5 per cent. more expensive to run than petrol vehicles, but that 2-, 3½-, and 5-ton "electrics" are cheaper than the corresponding sizes of petrol vehicles by 2, 7, and 15 per cent. It could, therefore, be argued that there is no room at all for light electric vehicles, but some British firms of high standing continue to build electric vehicles for light delivery work. The operating cost of petrol vehicles is further illustrated in fig. 2, which shows the cost per vehicle mile of ¼-, 1-, 2-, 3½-, and 5-ton machines for annual mileages up to 10,000. The petrol vehicle is, of course, quite capable of distances up to 70,000 miles per annum; there are, however, many cases in which the mileage requirements are well within the capacity of the battery vehicle, and a concrete example of this kind is the German postal delivery system. The German Government has now in use 800 electric vehicles for postal deliveries, and the magnitude of this undertaking is so great that it is worthy of further description. Only two types of vehicle are used, and they are very similar in design; the load capacity is two tons, and a single motor drives the rear wheels through a differential countershaft and chains. Pneumatic tires are used; the batteries are of the thin-plate lead type, and each consists of 40 250-amp.-hour cells. The mileage per charge obtained regularly is 36 to 42 miles, but it is stated that it is not a rare occurrence to get 60 miles per charge. The battery life is 6,000 to 7,000 miles for positive plates and 12,000 to 18,000 miles for negative plates. It is said that the use of pneumatic tires reduces the energy consumption by from 10 to 15 per cent. on stone-paved roads, and by from 3 to 5 per cent. on asphalt roads, as compared with solid tires.

TABLE VI.—WEEKLY OPERATING COST OF PETROL, STEAM, AND ELECTRIC VEHICLES.

Load (tons).	Petrol.	Steam.	Electric.
0.5	117/-	—	137/-
1	146/-	—	153/-
2	176/-	—	173/-
3.5	212/-	249/-	198/-
5	246/-	275/-	224/-

There is hardly anything more reliable than a really good electric vehicle, and an engineer who purchases wisely will never be worried by vexatious reports of breakdowns. The jobs which an electric vehicle can do in connection with a large electricity department are very numerous, and there is usually work for lorries, vans and tractors. In the case of the Glasgow Corporation Electricity Department, the light lorries and vans are used in connection with the showroom, meter, and welfare departments, the heavier lorries and tractor on the mains department services, while the heaviest tipping lorries are used for the removal of ashes from the power stations. A well-operated fleet of machines is also a good advertising medium and cannot fail in the end to impress on other transport users that there is really something in electric vehicles.

Discussion.

Mr. A. NICHOLS MOORE (Newport, Mon.) said the author had done a good service in jogging the industry a little, because he believed there were many opportunities for useful service for the electric vehicle. It must, however, be kept to its right sphere. A good deal of trouble had been due to enthusiasts, in pushing the electric battery vehicle forward, advocating it for every possible kind of service, whereas it was quite clear that it was not suitable for many classes of service. At Newport he had had 6½ years' experience with electric vehicles for refuse collection and in some respects the figures he had obtained differed strangely from those in the paper. For instance, the energy costs were 0.0624d. per mile, as against 2d. in Newport for the 2-ton vehicle. It appeared that the author took 15 years as the life of the vehicle, which he did not consider at all reasonable. Apparently, too, a mileage of 10,000 per annum was taken as the basis, but that mileage was not obtained in practice; if from 3,000 to 4,000 miles per annum were run in practice, then they were doing very well. The cost of renewals in the paper rather agreed with his own figures, but he had depreciated his batteries on a three years' basis, although he managed to get 4½ years out of most of them. The cost of maintenance of the vehicle, apart from the batteries, had been very heavy indeed at Newport, and that had been due to faulty construction. The result was that he had scrapped the earlier vehicles and was using them as trailers behind the later ones. One of the reasons why the electric battery vehicle had not made greater progress was the direct opposition and antipathy of borough surveyors, and he said, without hesitation, that that was one of the greatest difficulties to be got over. At the same time, there was a great deal to be said for that opposition, based on experience of such vehicles for refuse collection. When used for the delivery of refuse at a tip such vehicles were hopeless owing to the rough handling they received; when used for delivery at a destructor they could be built with a low loading line and could be used under the most favourable circumstances. The fact was that in recent years the design of petrol vehicles had been considerably improved, whereas the manufacture of electric vehicles had stood still.

Mr. A. W. BLAKE (Willesden) had little fault to find with the figures in the paper as they confirmed his own experience. He urged supply station engineers to develop the use of the electric vehicle because the load of one vehicle was worth that of 10 cookers and was off the peak, while cookers were not always. His own policy had been to keep the men thoroughly interested in the vehicles and arrange to teach them how to look after every part of the vehicle. In that way, he had been able to create quite an intelligent interest and the men had been able to win a few prizes. As the result of thorough attention in the garage it had been possible last year to run 14 vehicles for 307 working days, and a great deal of overtime, with a loss of only 14½ hours' stoppage on the road. With regard to the life of 14 or 15 months mentioned in the paper for the in-plate batteries, he had found that by renewing the positive plates at the right time it was possible to get something like another year's life out of the batteries.

Councillor J. THICKETT (Walsall) urged a progressive policy on the part of supply station engineers as regards the use of electric vehicles, which were not advertised enough.

Mr. J. W. BEAUCHAMP (E.D.A.) said that if the electric vehicle had not some virtues it would have disappeared long ago. In spite of their neglect in developing it, there were 2,500 electric battery vehicles in this country in addition to a large number of platform trucks. It was necessary, however, to discriminate very carefully in handling the main electric-vehicle business for road transport and not endeavour to push it for unsuitable purposes. Endeavours should be made to push the vehicles, not in cases where only one vehicle would be required, but where a dozen or more were necessary. He had been very much impressed, from recent inquiries, by the fact that so few municipal electricity departments had any mechanical transport at all; it was time every supply department had mechanical transport, preferably electric, not only because of its practical use, but because of the advertisement offered. What was required was a very distinct and concentrated salesmanship effort.

Mr. A. H. SHAW (Ilford) said that in Ilford the first vehicle was started 11 years ago (a 4-ton wagon) and as the result of that experience it was found that a 4- or a 5-ton wagon for coal-carrying for the Electricity Department was very much cheaper than any other means of transport; that was short-distance heavy-haulage, for which purpose the electric vehicle would easily beat steam or petrol. He was glad to say that the Ilford Public Health Department had also taken up electric vehicles for house-refuse collection, whilst the Electricity Department had now a second vehicle for coal haulage. Last year he purchased a small tractor for hauling cable drums, but the registration authorities asked for a tax of £22 because they said it was not an electric vehicle, but a tractor. After considerable protest and much assistance from the Electric Vehicle Committee, a tool box was added and the vehicle was called a truck, with the result that the usual tax of £6 was imposed by the taxation authorities.

Mr. C. W. MARSHALL, replying to the discussion, said his figures were all taken from actual Glasgow experience; 10,000 miles a year was certainly a good annual mileage, but it was being obtained and anybody who would accept 3,000 miles was easily satisfied. Perhaps the reason why the maintenance was heavy at Newport was because they had some of the early vehicles which were badly constructed; he had had some of them himself. On the other hand, he had vehicles which had needed practically no repairs; they did from 25 to 35 miles a day and gave no trouble at all. The reason was that there were only 10 working parts in the whole of the vehicle. As to refuse collection, he had found it paid handsomely to use electric vehicles for delivering to tips. He agreed as to the value of educating the workmen in the care and maintenance of the vehicles and Birmingham was also doing work on the same lines. The renewing of the positive plate, as mentioned by Mr. Blake, did add to the life of the battery, but the output was reduced. Generally, he claimed, that it was the business of the station engineer to push the electric vehicle, and they should not blame the public health authorities for not adopting them if they were not pushed.

Alderman H. LEESE (Stoke-on-Trent), in proposing a vote of thanks to Mr. Marshall, said that at Stoke they paid the drivers of their electric vehicles about one-third more than was paid in Glasgow, and added that as the result of using electric vehicles it had been possible to halve the cost of getting coal from the sidings to the works.

Mr. W. C. P. TAPPER (Stepney), who seconded, expressed the hope that the suggestion in the paper that an electric vehicle should be constructed to correspond with the horse vehicle so far as speed was concerned, would not be acted upon by manufacturers because they wanted to rid the streets of slow-moving traffic.

The I.M.E.A. Exhibition.

(*Continued from page* 932.)

Messrs. ELECTROLUX, LTD., displayed and demonstrated the "Electrolux" household refrigerator, model "D," and cooling unit (ELECTRICAL REVIEW, February 26th, 1926, p. 327). This model has a white-enamelled finish and is designed as a handsome piece of kitchen furniture. The walls contain 3 in. of cork insulation and are lined on the inside with washable white enamel. Well-spaced glass shelves provide accommodation for a large amount of food.

Messrs. SADIA ELECTRICAL APPARATUS exhibited several types of electric storage water heaters of from 2-gallon capacity upwards. The special feature of the stand was the new 2-gallon type of water heater, fig. 7. This boiler, which combines all

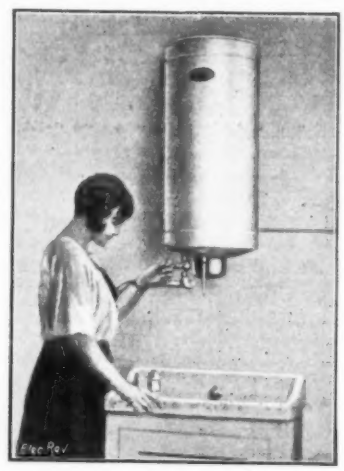


Fig. 7.—Electric Storage Water Heater.

the special advantages of the larger Sadia apparatus, has the additional advantage of being compact and of small dimensions, and is therefore suitable for use over wash-hand basins and sinks in flats and small houses. Some new designs of electric quick-heating plates were also shown. These were of the enclosed type and mark a new departure in this apparatus, combining efficiency with speed in operation.

An interesting selection of storage geysers were displayed on the stand of the BASTIAN METER CO., LTD., including some arranged over both a suitably-arranged bath and sink. It is interesting to note that "Bastian" geysers are now hired or hire-purchased to their consumers by more than 20 different municipal undertakings in England alone. The "Imperator" stove, some models of which were also shown, is designed to replace the steam radiator. Three new "Imperator" 1-kW fires and a number of pigmy heaters for table use added to the interest of the exhibit, while a feature was the "Little Wonder" grill ovens, which were fitted with "Bastian" quartzalite elements. Various types of these elements were included in the large number of articles on the stand. A few electric steam boilers were also included in the exhibits. These were of the fire-tube type and fitted with "Quartzalite" elements, which, it is claimed, can be taken out and replaced while the boiler is actually under steam. This type of apparatus is claimed to have an efficiency of 98 per cent. A feature of it is that it will produce superheated steam up to 500 deg. F. at a pressure of only 5 lb. per sq. in. "Bastalite," a product of the company, is of some interest. It is a preparation which is painted on the bottom of the kettle, to improve the efficiency of absorption, and which, it is claimed, will not wash off.

As might be expected, the feature of the exhibit by Messrs. BERRY'S ELECTRIC, LTD., was a display of the "Magicoal" electric fire, which imitates a blazing coal fire, introducing flickering flame effect. Several new models were shown, of which the following is a selection:—The "Newberry" fire is designed on new and novel lines with overhead heating, which incorporates a new patented 2-kW circular heating bar. The heating efficiency of this apparatus is claimed to be particularly high. The "Fyglo" model has been produced to meet the requirements of hiring schemes, particular attention having been paid to the cheap renewal of element wires. A good fire effect is obtained without the use of a lamp. A new design of the "Mulparvo" model is being introduced. This is built on similar lines to that of the existing fire of the same name, but it is improved greatly in appearance and has a loading of 2 kW with three-heat control, against 1 kW on the old model. Other examples of fires shown included some of the dog-grate type of period designs. Extreme care has been taken with a view to economy in the cost of production of these hitherto expensive models, which has resulted in considerable reductions in some of the very attractive fires.

Fig. 8.—The B.T.-H. Stand.

A large stand occupied by the HOTPOINT ELECTRIC APPLIANCE CO., LTD. ("Hotpoint-Falco") occupied the whole of one side of the Main Hall. The feature of the exhibit was a representative display of electric cooking apparatus, including heavy cooking appliances for hotels, restaurants, and ships. The heavier appliances consisted of pastry and baking ovens, roasting ovens, boiling pans and fish fryers. In the last mentioned, three different methods of heating were shown, radiation, conduction (clamp-type elements), and direct heating by induced currents (ELECTRICAL REVIEW, April 2nd, p. 561). The domestic cookers were in sizes for from two to three people, such as the No. 3,252 bungalow model, increasing up to the double-oven range for 25 to 30 people, which is suitable for small restaurants and large private houses; baking plates, wash boilers, and grills were also included in the display. A few cookers were in actual service, demonstrations being continually carried out, and these included the following novel features in the boiling plate elements:—A new standard semi-enclosed boiling plate, a plate with "Globar" elements, and a new solid-type plate. The electroducer cooking was also demonstrated.

The JACKSON ELECTRIC STOVE CO., LTD., showed some improvements which have been incorporated in its existing models of cookers. These included a new type of grill with easily-removable elements on the lines of the maker's No. 84 boiling plate. This grill can be arranged with 3-heat regulation. A cooker with side and bottom elements was shown by request, and a stainless-metal hob fitted to one of the cookers was an item of interest. A feature of the exhibit was a new type of electric kettle fitted with an automatic cut-out. No fusible plugs or replacement parts are needed to put the kettle in operation again after the cut-out has been in action, the connection being remade by the consumer. The contact is a positive make-and-break switch, and this apparatus should prove of interest to those dealing with hiring schemes.

A particularly pleasing and informative exhibit was shown by the E.L.M.A. LIGHTING SERVICE BUREAU, the arrangements of which were largely carried out by the Scottish Section under the direction of Mr. H. E. Hughes, the district engineer. An ingenious lamp display cabinet, illustrating the wide range of standard electric lamps, was a feature of the stand. Each lamp could be switched on, and at the same time the number of hours' burning per kWh was indicated on a luminous sign. This was particularly appreciated by the public. In addition to standard gasfilled lamps, there was a display of daylight, white, and coloured-sprayed lamps. Home-lighting cubicles were included in the display to represent the different aspects of home lighting and to contrast the effects that could be obtained by modern methods of lighting with those of bad design. To represent the vast progress in electrical illumination during recent years, special demonstration cabinets were included in the stand equipment. These were in four series each. The cabinets represented home, loom, factory, and colliery lighting. In each case the lighting equipment, whether modern or old, was illustrated by appropriate backgrounds. To emphasise the value of shop lighting and to illustrate how maximum efficiency could be obtained by electric lighting in properly-conceived reflectors and glare entirely eliminated, model shop windows were featured. These were designed so that a shopkeeper could actually experiment for himself and be thoroughly convinced of the efficiency of modern shop-window lighting equipment. A well-produced booklet, "Lighting Service," which was issued by the Bureau in connection with the Exhibition, outlines the work of that body, and shows the necessity for good lighting in all directions.

The Glasgow Corporation Electricity Department had a splendid display. Chamberlain & Hookham special prepayment two-part meters, a minimum power-factor meter, and a demand indicator with a self-contained synchronous motor were prominent and attracted much notice. Visitors interested in housing paid considerable attention to the "Selfix" electric installations; by using the special materials supplied with a "Selfix" outfit it is claimed to be possible for any man to put in a complete electric-light installation which will meet the requirements of the Institution of Electrical Engineers. The Corporation also showed cookers and fires, British-made vacuum cleaners, Venner time switches, a British Resistor hot-plate, fire, and furnace, and Wilkinson thermostats. The fittings on the stand were by Osler & Faraday.

Messrs. SMITH & PAGET, LTD., had an interesting display of electric washing and mangling apparatus.

The MOFFLARY, CANADA, company showed some excellent designs of electric cooking apparatus.

The Electrical Association for Women had an attractive stand, displaying pamphlets, &c., while the British Electrical Development Association (Inc.) also displayed leaflets relating to their work.

In addition to the new "Cosmos" electric boiling plate, described fully in our last issue, MESSRS. METRO-VICK SUPPLIES, LTD., exhibited several new types of electrical domestic appliances, some new internally frosted lamps, a selection of chromium-plated Harcourt fittings, and a new type of lampholder, the "Emvee," which is designed with solid plungers and has a large current-carrying capacity. A Brighton street lantern was also shown.

A variety of domestic apparatus was shown by Messrs. L. G. HAWKINS & CO., LTD., and the "Universal" cookers occupied a large portion of the stand. A "Kelvinator" refrigerator was also on show, and also a whole line of "Universal" coffee percolators, irons, kettles, toasters, some "Miller" fittings and a selection of "Ivanhoe" glassware. The "Junior" model "Vio-ray" high-frequency apparatus also proved interesting. The high-frequency coil of this apparatus is of special design, which prevents, it is claimed, any sparking back or risks of breakdowns. The kicking coil and break are assembled in a "Bakelite" container, and the high-frequency coil is assembled in a high-grade ebonite handle.

Included in the exhibits of the GENERAL ELECTRIC CO., LTD., which we referred to in our last issue, was a new design of "Magnet" electric suction cleaner. The feature of this device is that the nozzle brush is so designed to straighten out any loose threads on the surface to be cleaned ready for absorption, and simultaneously to press back the pile of the carpet, so that the suction may withdraw the dust and grit from the weave and knots of the pile, and even from the underside of the carpet. It is claimed that the brush does not become choked and dirty as in the case of the ordinary broom, because the constant suction of the cleaner swallows every particle of dirt and grit over which the cleaner passes; the suction is applied evenly across the nozzle. This is designed to facilitate cleaning under low furniture. A swivel-type rear wheel enables easy operation in any direction; all the wheels are rubber-tired and leave no track, it is claimed, in the rug or carpet. The control switch is at the extreme end of the handle and a stop locks the handle in a horizontal position for the cleaning of stairways and difficult objects. The bag is composed of a strong material of fine texture, and is fitted with an aluminium airtight coupling. The lubricating system is automatic, the oil being injected through two spring-closed ball oilers and passed into small reservoirs, from which it is conveyed to the bearings by wick and spring devices. All the accessories are easily and instantly adjustable.

Fig. 8 is a view of the B.T.-H. stand to which we referred in our last issue. *(To be concluded.)*

An Electric Light-ship.—The *Royal Sovereign*, a light-ship stationed seven miles off Eastbourne, at present an oil burner, is to be fitted with a powerful electric light.

Exports and Imports of Electrical Goods and Machinery in May, 1926.

In the appended table giving details of our foreign electrical trade during May, the export comparisons both with April, 1926, and the preceding May need qualification, as neither shows the true position. In the first place April was a bad month and the decline of £40,878 is really a further fall from an already low figure. On the other hand, the decline of £550,135 in comparison with May, 1925, is not so serious as it looks, as the violently-fluctuating item, "submarine cables," accounted for £373,351 of the fall. In the face of the general strike, there were several notable increases, of which that in the traction motor section was the most marked.

The imports were seriously affected, having been reduced by a third from the April total, although the difference between the May totals for the two years was not quite so great.

The re-exports were less than half the April value, and only a third of the May, 1925, total.

Further reference to the statistics is made in our "leader" pages.

	Exports.			Imports.			Re-Exports.		
	Electrical exports for May, 1926.	Inc. or dec. as compared with Apl., 1926.	Inc. or dec. as compared with May, 1925.	Electrical imports for May, 1926.	Inc. or dec. as compared with Apl., 1926.	Inc. or dec. as compared with May, 1925.	Electrical re-exports for May, 1926.	Inc. or dec. as compared with Apr., 1926.	Inc. or dec. as compared with May, 1925.
Electrical goods and apparatus (unenumerated)	£120,269	−£29,189	−£13,778	£80,192	−£26,685	−£8,155	£4,267	−£3,895	−£12,152
Insulated wires and cables ...	199 238	+ 16,111	+ 4,143	21,918	− 25,616	− 13,102	755	− 319	− 2,611
Glow lamps	30,403	− 5,454	− 2,143	11,542	− 5,922	− 30,674	103	− 429	− 161
Arc lamps and parts	67	− 663	− 492	1,545	+ 803	+ 45	120	+ 113	+ 92
Batteries and accumulators ...	63,727	+ 5,503	− 32,473	24,513	− 13 955	+ 3,527	599	− 1,573	− 970
Meters and instruments ...	36,345	+ 3,920	+ 8,152	14, 48	− 5,183	− 3,282	236	− 551	− 951
Carbons...	1,475	+ 594	+ 553	7,249	− 3,615	− 1,629	21	− 33	− 34
Electrical Machinery—									
Electrical machinery (unenumerated)	243,190	+ 30,173	− 83.538	80,996	− 30,408	− 18,299	2,449	− 5,511	− 3,160
Railway and tramway motors	5[illegible],769	+ 31,425	+ 16 374	—	—	—	—	—	—
Other motors and generators...	128,224	− 49,277	− 54,391	—	—	—	—	—	—
Switchboards (not telegraph or telephone)	2,837	− 6,654	− 9,591	28	+ 2	− 42	—	—	− 95
Telegraph and Telephone Cable and Material—									
Telegraph and telephone wires and cable (not submarine)	51,469	− 14,303	− 18.167	4 356	− 8,033	− 9,997	15	− 45	− 218
Submarine telegraph and telephone cable...	246	− 11,911	− 373,351	—	—	—	—	—	—
Telegraph and telephone instruments and apparatus ...	226.987	− 11.153	+ 8,567	23.167	− 12,744	− 23,972	2,822	− 1,524	− 2,610
Totals	£1,158,236	−£40,878	−£550,135	£269 634	−£131,356	−£104,838	£11,387	−£13,717	−£23 870

	Exports.	Imports.	Re-exports.
Decreases for five months of 1926 ...	£1,109,770	£385,491	£35,080

The Electricity (Supply) Bill.

The Proceedings in Committee.

(*Continued from page* 938.)

The appeal tribunal to be set up under Clause 4 was discussed when Standing Committee "C" of the House of Commons resumed consideration of the Electricity (Supply) Bill on June 14th. Sir R. Sanders presided.

Mr. R. HUDSON (Gateshead, U.) moved the insertion of the following proviso at the end of Clause 4, which deals with the duty of the Board to prepare and carry out the scheme:—"Provided that if any authorised undertakers on whom obligations are imposed by the scheme consider that the carrying out of those obligations would be prejudicial to them, they may, within one month after the publication of the scheme as adopted, by notice in writing, specifying the nature of the complaint and of the relief sought by them, require the Board to refer the matter complained of to the arbitration of a barrister (or in Scotland an advocate) of not less than ten years' standing appointed by the Minister of Transport, and the Board shall refer the matter accordingly, unless they amend the scheme by relieving the complainants of such obligations as aforesaid, and shall not, pending the determination of the complaint, carry the scheme into effect so far as it affects the complainants.

"(4) The arbitrator to whom any such matter is so referred may, if satisfied as to the justice of the complaint, either order such pecuniary compensation to be made to the complainants as seems equitable in all the circumstances or order the scheme to be amended in such manner as he may direct.

"Provided that the arbitrator shall not grant any relief other than pecuniary compensation in any case where the Board certify that the grant of such relief would conflict with the basic principles of the scheme or would prejudicially affect the efficiency of the scheme." Mr. Hudson explained that his proposal, which had been very largely discussed in advance, was merely an attempt to set up an appeal tribunal on the lines of the compromise which he had suggested earlier in the discussions.

Sir J. NALL (Manchester, Hulme, U.) moved to amend the amendment by leaving out the words "on whom obligations are imposed by the scheme," and to insert in their place the words "or any local authority or other body or person." It was essential, he said, that all those who might be legitimately concerned, should have an opportunity of stating their case to the tribunal. Mr. Hudson's amendment provided that authorised undertakers on whom obligations were imposed might appeal to a barrister to be appointed by the Minister, and the barrister, on such appeal, could not alter the scheme if the Board, which was one of the parties to the Bill, certified that such alteration would conflict with the principles of the scheme, or affect its efficiency, and the barrister could only order compensation to be paid to that authorised undertaker. That seemed to be rather a one-sided arrangement and would largely nullify the value of an appeal. The amendment which he (Sir J. Nall) was proposing would ensure that the very narrow limit of authorities on whom obligations were imposed should not be the full scope of the appeal tribunal.

Col. ASHLEY, Minister of Transport, thought it would be unwise to accept Sir J. Nall's amendment, which was then defeated by 28 votes to 16.

Sir J. NALL moved a further amendment to the amendment to leave out the words "carrying out of those obligations," and to insert instead the words "provisions of the scheme." Schemes of the kind indicated would contain provisions which did not involve the carrying out of obligations, and, in effect, Mr. Hudson's amendment was so drawn that not only would the parties who could come to the tribunal in the first instance be severely restricted, but the points on which they could appeal would be equally restricted if the words proposed to be deleted were left in.

Sir D. Hogg resisted the amendment, which was ultimately withdrawn.

Sir J. Nall moved to leave out the words " arbitration of a barrister (or in Scotland an advocate) of not less than 10 years' standing appointed by the Minister of Transport " in order to insert the words " tribunal of appeal by this Act constituted," because he intended later to move an amendment for a definite and permanent appeal tribunal, to consist of five members, who should be appointed for a term of five years by the Lord Chancellor.

The amendment was under discussion when the Committee adjourned.

On resuming on June 15th, Sir D. Hogg said that the Government would not object, later on, if the tribunal proposed in Mr. Hudson's amendment were utilised for other clauses and for other appeals which might come at a later stage of the Bill. The qualification of a barrister of not less than ten years' standing was the highest form of legal qualification that could be imposed. The Government, in accepting Mr. Hudson's amendment, was trying to meet the desire to give an appeal to some impartial lawyer. He could not accept Sir J. Nall's amendment.

Mr. G. Balfour (Hampstead, U.) wished to make the strongest possible protest against the proposed appeal tribunal. There was to be one arbitrator, with the power to say that rights which had been granted in perpetuity could be repealed on the *ipse dixit* of one man, without any appeal to Parliament.

Mr. Attlee (Limehouse, Lab.) suggested that there might be a panel of barristers from whom the chairman of the appeal tribunal should be selected.

Sir J. Nall's amendment was then negatived by 35 votes to 12.

Mr. Ellis (Wakefield, U.) moved to leave out the words " of not less than ten years' standing appointed by the Minister of Transport," in order to insert " qualified for appointment to high judicial office appointed by the Ministry of Transport from panels set up by the Lord Chancellor, or, in Scotland, the President of the Court of Session, respectively, for that purpose."

The amendment was accepted by the Government and agreed to.

Mr. Looker (Essex, S.E., U.) moved an amendment to permit the arbitrator, in any case in which he thought it expedient to do so, to call in the aid of one or more qualified assessors and to hear the case wholly or partially with the assistance of such assessors. The amendment was agreed to.

Sir J. Nall then moved to leave out the words :—" Provided that the arbitrator shall not grant any relief other than pecuniary compensation in any case where the Board certify that the grant of such relief would conflict with the basic principles of the scheme or would prejudicially affect the efficiency of the scheme." His object was to ensure that any monetary compensation ordered to be paid to the appellant by the tribunal should come out of the guaranteed fund; it was necessary to ensure that the cost of giving compensation should not fall on the industry.

The amendment was negatived.

On the question that Mr. Hudson's amendment, as amended, be added to the Bill, Sir J. Nall protested against what he termed a travesty of the tribunal which Sir D. Hogg had agreed to accept. The Board was left, for all practical purposes, the unfettered arbiter in its own house, able to override the statutory rights of municipalities, of great corporations, of county councils and urban and rural authorities, who would have no redress of any kind unless they came within the very narrow limits of the amendment, and, to secure redress, they must prove some financial loss. That was an entirely novel departure from the ordinary procedure of Parliamentary control of legislation, and was even a departure from the Act of 1919.

Mr. G. Balfour also protested against the tribunal, and urged that the Board should be made answerable to Parliament.

Mr. Hudson's amendment, as amended, was agreed to and added to the Bill.

An amendment, moved by Sir J. Nall, to add at the end of the clause the words :—" Provided that a generating station included in a scheme as a selected station shall not cease to be a selected station without the consent of the owners thereof," was accepted by Sir D. Hogg and agreed to.

Clause 4, as amended, was then agreed to, and the Committee adjourned.

On June 17th, consideration was given to Clause 5, which sets forth the procedure to be adopted by the Board for dealing with existing selected stations.

Sir F. Hall (Dulwich, U.) moved an amendment to provide that, with regard to the scheme, the owners of selected stations should be consulted in all cases in order that there should be no material alterations in schemes that had already been put into operation. In view of the money that had been spent on generating stations the owners should know exactly what was to happen.

Lt.-Col. Moore-Brabazon, the Parliamentary Secretary to the Ministry of Transport, said that Sir F. Hall was really trying to re-open a question which had already been decided.

Mr. G. Balfour pressed for an outline of the scheme. The Committee had not the slightest information to guide it as to what was the intention of the Government in setting up these selected stations.

Sir C. Wilson (Leeds, Central, U.) declared that the profits made by certain existing concerns were, under the Bill, to be confiscated in order that certain areas might benefit. The scheme was, apparently, to be a second " Post Office scheme," but even the General Post Office was careful not to take over any concern or interest that did not pay. The whole of the people of Leeds, and all the Chambers of Commerce, were against this scheme, which he would do his utmost to expose on every possible occasion.

Sir G. Hume (Greenwich, U.) said he would be very disturbed if the Government had to prepare a scheme. Under the Bill it had been decided that the preparation of the scheme should be left in the hands of the Electricity Commissioners, who were highly competent to deal with these matters. He hoped the Government would be very careful not to put any scheme forward.

The amendment was negatived.

Sir J. Nall moved an amendment to provide that, where alterations or extensions to selected stations were required by the Board, they should be made under the scheme or under an amending scheme. Under the amendment, he said, the owners would be protected against unreasonable requirements in regard to large capital expenditure by having the right of appeal to the arbitrators appointed under Clause 4. The Board, under the Bill, could require the owners to undertake such extensions and alterations as it might think fit without having any opportunity of repeal or redress.

Sir D. Hogg accepted the amendment, which was agreed to.

Sir J. Nall then moved a further amendment to provide that large additional alterations or extensions should be dealt with under an amending scheme, and that the owners of the stations affected should have the right of appeal to the arbitrators.

Lt.-Col. Moore-Brabazon contended that Sir J. Nall was endeavouring to start *de novo*.

Mr. G. Balfour protested against the final decision in a matter of this sort being left in the hands of a " bureaucratic Department." Alterations might be made involving £1,000,000 or £1,500,000, and they, he thought, ought certainly to come under an amending scheme with the right of appeal.

The amendment was negatived.

Sir D. Hogg next moved an amendment to ensure that the additional extensions and alterations which the Board might direct to be undertaken must be approved by the Electricity Commissioners before being put into operation. He explained that under the Clause as it at present stood there was to be an appeal by the owners to the Electricity Commissioners and a further appeal to the Railway and Canal Commission, but it was now desired to have one appeal tribunal throughout the Bill and the Government had agreed to that principle, and would provide for that in a later amendment. That procedure would involve there being no real safeguard, apart from the Board's own decision, on technical matters, which would raise a difficulty under the 1919 Act (Section 11) under which the consent of the Electricity Commissioners was required for any extension. It would be ludicrous if the Board directed that extensions and alterations were to be carried out, and then the Commissioners would not give their consent to them. To prevent that difficulty the amendment would provide that the Board should only direct additional extensions or alterations if they were approved by the Electricity Commissioners.

The amendment was agreed to.

Sir D. Hogg then moved to leave out that portion of subsection 1 of Clause 5, which provided that in the event of the Board's directing, with the Commissioners' approval, the carrying out of additional extensions or alterations which might be unreasonable, there should be the right of appeal to the Electricity Commissioners and then to the Railway and Canal Commission, and to insert instead the words " impose upon them an unreasonable financial burden, the matter shall, if they so require, be referred to the arbitration of a barrister (or in Scotland an advocate) appointed by the Minister of Transport from the appropriate panel set up under section 4 of this Act, and the arbitrator may in any case in which he thinks it expedient to do so call in the aid of one or more qualified assessors and hear the case wholly or partially with the assistance of such assessors." He said that as the Clause had been amended, there would be an appeal to the Electricity Commissioners from the Commissioners' decision, which would be impossible. Therefore, the Government had decided that the tribunal established under Clause 4 should hear appeals against unreasonable financial burdens, and his amendment would provide for this.

The amendment was agreed to. The Committee has thus decided that, under the Clause, the appeal by owners of " selected stations " on technical matters should be to the Electricity Commissioners, and, on financial matters, to the arbitration tribunal set up under Clause 4.

Sub-section 2 of the Clause provides that if the owners of any selected stations are unwilling to " carry out such arrangements to the satisfaction of the Board, the Board shall be entitled to acquire the generating station at a price to be determined in accordance with the provisions of the First Schedule to this Act. . . . ."

Sir J. Nall moved an amendment to leave out the words " Board shall be entitled," and to insert the words " Minister of Transport may by order empower any authorised undertaker or any other company or persons approved by the Board or failing such authorised undertakers, company, or persons, the Board." The amendment was accepted by Sir D. Hogg, and carried by 35 votes to 12.

Sir J. Marriott (York, U.) moved to provide that before any generating station could be acquired by the Board, the Board must apply to the Minister of Transport for an order to do so, and then the matter must be referred to the Appeal

Tribunal to consider the substance of the complaint made by the Board in respect of the alleged default of the owners, and the Minister shall not have the power to make the order until the appeal has been heard. He maintained that the Board ought not to have the drastic power of breaking up a statutory authority until a full inquiry had been held.

Sir D. HOGG, however, pointed out that Sir J. Marriott's complaint had been met by the previous amendment which he had accepted. Sir J. Marriott therefore withdrew his amendment, but moved that "any such Order shall be provisional only and shall not have effect unless and until confirmed by Parliament."

Col. W. ASHLEY considered that the setting-up of the appeal tribunal rendered this Parliamentary safeguard, which would involve considerable expense and delay, unnecessary.

Mr. HANNON (Moseley, U.), in supporting the amendment, felt that to allow a body outside Parliament compulsorily to acquire private property protected by Statute, was an innovation which should be very carefully considered.

Sir D. HOGG considered that there was already sufficient safeguard, but eventually moved an amendment to provide that an order authorising the acquisition of a generating station should not come into force until it had been laid before the House of Commons and the House of Lords for a period of thirty days, and that if either House objected the order should not be proceeded with.

Sir J. MARRIOTT's amendment was then negatived, and the amendment of Sir D. Hogg was agreed to.

Major ATTLEE moved an amendment to the effect that where a generating station was acquired by the Board, the Board should either operate it itself or make arrangements with an authorised undertaker who should be a local authority instead of 'a company or person.'" The Labour Party, he said, stood for public control in electricity.

Sir D. HOGG resisted the amendment, which was negatived.

Major ATTLEE next moved to provide that if the Board were to acquire a generating station in the area of a Joint Electricity Authority the Board should first endeavour to arrange with the Joint Authority to operate the station.

Sir D. HOGG accepted the amendment, which was opposed by some of the Government supporters. It was eventually carried by 25 votes to 13.

Clause 5, as amended, was then carried by 22 votes to 7, and the Committee adjourned.

(To be continued.)

Two Small Automatic Generating Plants.

WE have received some particulars of the electrical installations at two very old and historically interesting buildings, Dunvegan Castle and Kingsburgh, both on the Isle of Skye, which have been comparatively recently wired for electric light and power and equipped with generating plant. Dunvegan (fig. 1) is the oldest inhabited castle in Scotland, dating back to the 12th century, and has been in the possession of the Clan McLeod for 700 years, the present owner being the MacLeod of MacLeod. There are about 180 lights in the castle and an interesting feature is that in several instances the original ancient lamps have been adapted for electric lighting. The dungeons, which could tell many harrowing tales of prisoners who lan-

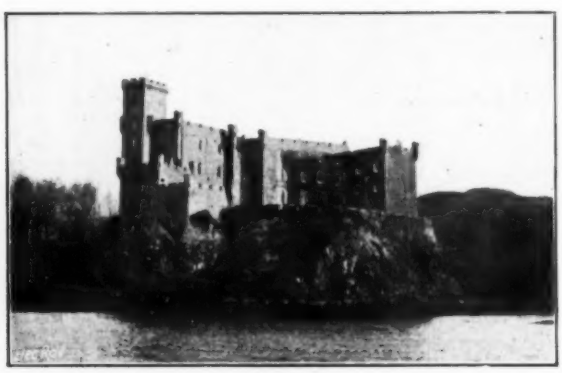


Fig. 1.—Dunvegan Castle.

guished and died in them, now have lost most of their terror, for they too are electrically lighted. The generating plant consists of two 1,500-W, 110-V Kohler automatic generating sets arranged for parallel working. Each set consists of a 4-cylinder petrol engine directly coupled to a compound-wound dynamo. The engine is started and stopped by means of an automatic switch mounted over the dynamo. This switch is fitted with three main relays which, when the first load is switched on, are energised from a small 24-V starting battery which supplies the necessary ignition current for starting the engine and also drives the generator as a motor up to about 50 r.p.m., at which speed the engine starts firing and the controlling relays are de-energised.

A safety switch-tripping device is incorporated in the automatic switch, which, if for any reason, say, want of petrol, the engine does not start within one minute, throws the switch out.

A similar automatic device is installed for paralleling the machines. When only one machine is running, this equipment carries the main current, and when full load is reached, relays are energised in a similar manner and the second set is run up and put on load with the first. When the load decreases, the reverse action takes place. A d.p. change-over switch is fitted to the paralleling device, by means of which

Fig 2.—Kingsburgh.

either machine may be put on circuit first. The operation of running up the first machine and also of paralleling in the second, is only a matter of few seconds.

Kingsburgh (fig. 2) is famous as the house in which there lived that great lady whose name will for ever be romantically associated with her bravery in conducting the pursued Bonnie Prince "Charlie" to Skye, *viz.* Flora Macdonald. Here there are 65 lights in the installation and the energy is supplied by one Kohler automatic set similar to those installed at Dunvegan Castle. This has been in uninterrupted use for 2½ years.

Both of these historic buildings were wired on the Henley wiring system, and the entire electrical work for both installations was carried out by Messrs. Lowdon Bros. & Co., of Dundee, to whom, and to Messrs. W. T. Henley's Telegraph Works Co., Ltd., we are indebted for the above particulars and the photographs.

New Electrical Devices, Fittings, and Plant.

(Readers are invited to submit particulars of new or improved devices and apparatus.)

Vertical Gravity Coal Dryers.

A very simple form of coal dryer and preheater is being marketed by MESSRS. FUEL ENGINEERING, LTD., Parliament Mansions, Victoria Street, London. The "F.E." dryer, fig. 1, consists of vertical hollow louvred columns or walls,

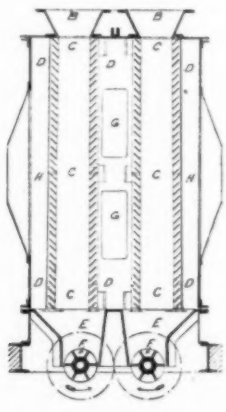


Fig. 1.—Vertical Coal Dryer.

headed by suitable hoppers, the size and number of the columns depending on the character and quantity of the material to be dealt with. Waste gases from the boiler or furnace flue are utilised and are drawn through the walls con-

taining the coal, the louvres forming the necessary inlet and outlet. Facilities are provided for controlling the temperature at which the drying is effected; and the rate of travel of the coal through the columns can be varied to suit the conditions and the character of the coal, the device for this control being the only mechanism employed. The dryers can be constructed in single units with capacities of from 1 to 25 tons per hour.

A Solder Compound.

Another solder compound, "Zippo," for use without the aid of fluxes, acids or other cleaning agents, has recently been introduced by MESSRS. ENGINEERING TOOLS, LTD., 11B, Upper Thames Street, E.C.4. This material is produced primarily for use with aluminium and other non-ferrous metals and alloys. We have used "Zippo" and obtained a good joint, and while we would not hesitate to recommend its use where strength is required we would point out the necessity of following closely the instructions issued for working with it. Rather a higher temperature is required for "Zippo" than for ordinary solder. It is made in two grades, medium and hard, the latter being necessary for only exceptional cases. The results of tests carried out on joints made with this new material at the University College, London, show a tensile strength of 3.79 tons per sq. in. for a medium "Zippo" joint, 0.35 in. by 0.34 in.; also a strength of 6.35 tons per sq. in. for a hard "Zippo" joint of 0.32 in. by 0.345 in. The material is made in bars to suit the trade or the domestic user; it has a fusing point of 280 deg. C., and it is claimed to have a heat conductivity equal to that of copper, and that it is unaffected by atmospheric conditions.

A Light Electric Car.

Notwithstanding the ever-increasing popularity of petrol-driven vehicles, it is interesting to learn that the SOCIETE DES APPLICATIONS ELECTRO-MECANIQUES, of 148, Avenue du Roule, Neuilly-sur-Seine, France, has recently introduced a little two-seater car known as the "Electrocyclette" which weighs only 5 cwt., complete with a battery of 10 cells, and is capable of allowing a distance of about 30 miles to be run on one charge at a speed up to 12½ m.p.h. The frame of the chassis is constructed of armoured ash, and suspended fore and aft on semi-cantilever springs. The compound electric motor is rated at 3-4 h.p.; it is located at the rear of the vehicle and drives the rear axle through bevel gearing, the accumulators having a capacity of 250 amp.-hours at 28 volts. A three-position hand

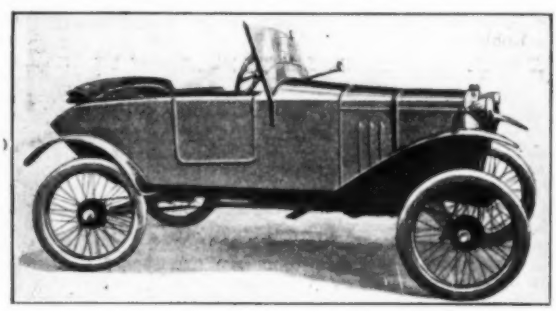


Fig. 2.—The "Electrocyclette" Two-seater Car.

lever (forward, reverse and brake) is provided, while intermediary speeds are controlled by an accelerator pedal; there is also a pedal actuating a brake on the rear wheels. The cost of running is negligible and for those requiring a simple vehicle for conveying them between their residence and place of business, within a distance of 15 miles, or for short out-and-home runs of not more than 30 miles, the makers claim that the "Electrocyclette," fig. 2, is an ideal vehicle. When alternating current only is available for charging the battery a simple rectifying device can be fitted permanently on the car. The vehicle has a wheelbase of 6 ft. 4in. and a track of 3 ft. 3 in., 500 by 50 mm. pneumatic tyres being fitted to the wire road wheels. The Company is also making a single-seated vehicle suitable for the use of invalids. This is fitted with a 150 amp.-hour battery of eight cells, of a capacity for about 20 miles on one charge.

Spiral Rolled-Steel Transmission Poles.

What promises to be of considerable interest to transmission-pole users is a new type of pole, of spiral rolled steel, fig. 3, embodying a new method of construction, which is being made by the BRITISH ROLLED STEEL POLE CO., LTD., 110, Cannon Street, London, E.C.4. These poles are constructed under the Kershaw Walker patents from rolled steel strip. This strip, which varies in thickness from 1/16th in. upwards, in passing through the rolling mill, has impressed on its surface a raised projection, or rib, parallel to the edge longitudinally, and the strip is spirally coiled upon itself with its edge lying close up to, and directly under, the rib, which serves as an interlocking device, and prevents any collapse or vertical or horizontal depression of the pole. It is claimed that the rib adds greatly to the strength and rigidity of the structure, which is further stiffened by the spiral or helical convolutions being hermetically sealed to the body of the pole. The poles are claimed to be remarkably light, rendering them suitable for transport over long distances, and immune from the attacks of insect borers; thus they are suitable for tropical and sub-tropical countries. They are made in lengths varying from 16 to 30 feet, having a diameter of 2½ in. at the small end and 4 to 6 in. at the base. Longer poles are made of heavier steel.

The spirally-wound poles taper very gracefully, are elegant in appearance, and they can be painted, galvanised, or otherwise protected both inside and outside. Cast iron, concrete

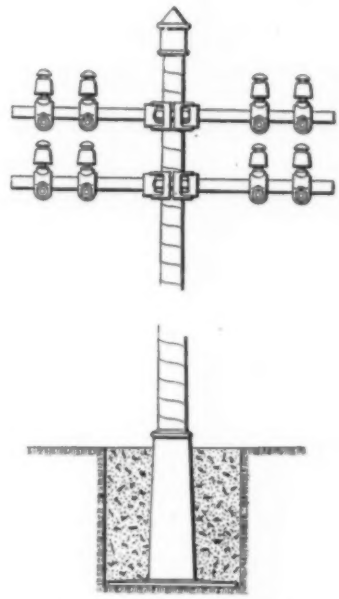


Fig. 3.—Spiral Rolled-steel Pole.

or other shields of various designs to guard the lower ends of the poles from corrosion at the ground line can be supplied with the poles where required.

The weight of the pole varies from 54 and 101 lb. (16 and 30 ft.) in the case of the light steel strip, to 67 and 126 lb. and 88 and 164 lb. for No. 14 and 12 gauge steel respectively.

The Finance of Electricity Supply.

Municipal Accountants' Conference.

AT the annual conference of the Institute of Municipal Treasurers and Accountants, held at Southport last week, a paper was read by Sir Harry Haward on the "Finance of Electricity Supply Undertakings in Great Britain."

At the outset the speaker explained that having regard to his official position as an Electricity Commissioner it was not his intention to raise matters of a controversial nature, but to give a paper which was informative rather than critical. After briefly sketching the development of electricity supply, public control, and the raising of capital, reference was made to capital expenditure, and in making the statement that expenditure on main transmission lines by private companies had been £4,259,241, as against £3,966,441 by local authorities, Sir Harry explained that the reason for this was because the heading "companies" included a number of large power companies. He stated that there was very little "watered capital," and that although a rather large figure was shown in the table which he had prepared under the heading of "Public Authorities—Miscellaneous," he explained that this included the unallocated cost of purchasing certain undertakings, notably the St. Marylebone Corporation's expensive purchase of a London company. The speaker's remarks dealing with working capital were the subject of considerable criticism in the subsequent discussion. The speaker said that under existing legislation a local authority was allowed to borrow for the purpose of providing temporarily for any current expenses, on the condition that the amount borrowed should be repaid out of the revenue received in respect of the financial year in which the expenses were incurred. Several speakers strongly resented this method of dealing with the matter, and it was said that one of the greatest weaknesses of public undertakings was the serious overdrafts. Temporary borrowing only scratched the surface of the matter, and permanent capital was required for working expenses. Mr. J. H. McCall, of Croydon, protested vigorously on this point, and pointed out that public authorities might be in the peculiar position of having invested reserves on one side of the balance sheet and an overdraft on the other. Sir Harry Haward subsequently reminded the speaker, however,

that reserves must of necessity be invested in securities, and could not be utilised for working capital or invested in wasting assets.

The remuneration of capital was dealt with at some length, together with the repayment of loans and depreciation, reserve funds, purchase options, and the allocation of profits, and in the last connection the following statement was received with obvious goodwill. "Further, there is force in the plea that as the local rate is mortgaged for all moneys borrowed for the purposes of the electricity undertaking and is liable for any deficiency thereon, the ratepayers are entitled, if they so desire, to some benefit in return for the risk involved and the advantage which the consumers obtain by the pledging of the municipal credit. So long as the sum taken in relief of rates does not cause the prices of electricity to be raised above ordinary commercial rates the consumers have no just cause for complaint."

Referring to average price obtained, Sir Harry said that the companies received very much more for lighting and domestic purposes, but in the aggregate the amounts received were much the same as those received by the municipalities. The speaker's final remarks dealt with joint electricity authorities and the proposed Central Electricity Board, emphasis being laid on the fact that "it is not contemplated that the Board will ordinarily acquire or construct generating stations or carry on extensions of stations, but that this work will be undertaken and financed as now by the existing undertakers."

In the course of the discussion Mr. ARTHUR COLLINS pointed out the necessity for local authorities to inquire into the terms granted to old customers. There were often ways in which agreements made at the very outset of the undertaking could be revised, and investigation would prove whether this was possible or not. He urged that local authorities dependent for supplies upon private companies should see that their interests and rights were "subject to oversight." Reconsideration should periodically be given to any recurrent purchase options, and the borough treasurer should submit a report on the accounts to the finance committee. The new Bill, he feared, would establish a rival borrowing authority.

Alderman A. J. BLANCHARD (Sheffield) said that he was voicing the views of many authorities when he said that he wished that the Bill only dealt with transmission. In any case, he maintained that local authorities, such as his own, where prices lower than the average were charged, should be left alone. Sheffield was already supplying at a lower price than the Government expected to be able to attain 16 years hence. Further, they had allocated no less than £70,000 to relief of rates. Under the present proposals they would, in any case, be losers to the extent of the capital raised out of revenue. This view was also expressed by Mr. E. J. JOHNSON, O.B.E. (West Ham).

Councillor COTTRELL (West Bromwich) amused the audience by asking the speaker if he could guarantee that West Bromwich would obtain lower charges by entering into an agreement with the West Midlands Authority. They were told that the surrounding district would benefit, but what he wanted to know was whether their local manufacturers would suffer. Sir Harry, in replying, said that whilst, naturally, he could give no guarantee, he could say that the scheme as outlined showed every likelihood of proving cheaper for town as well as country. The number of questions asked and the obvious desire of the members of the Institute Council to know more of the financial provisions of the Bill prompted the speaker to arrange a further meeting with the executive during the period of the Conference.

Correspondence.

***Correspondents should forward their communications at the earliest possible moment.** No letter can be published unless we have the writer's name and address in our possession.*

Electrical Literature.

Previous mention has been made in the "Correspondence" columns of the ELECTRICAL REVIEW of the vast number of books now published dealing with the design and construction of various classes of electrical apparatus and machinery. Several books of this type are indeed excellent works, but there is one point which I find is very often overlooked, and, in my opinion, it is a point well worthy of consideration.

I venture to suggest that if a few chapters were devoted to a discussion on some of the many practical methods that are at present applied inside workshops in connection with the manufacture of electrical apparatus and machinery, such chapters, apart from being very interesting, would prove to be distinctly helpful.

A book dealing with the design of electric motors might be considered as an example: much may be written regarding the electrical and mechanical design and general construction, but a "chat" on the methods of manufacture as adopted in many foundries, armature winding shops, assembly and testing departments, &c., would tend to the production of a more comprehensive work, for it is possible for one to concentrate very thoroughly on the design of an electric motor and to overlook certain difficulties that might occur in manufacture.

H. Breckell.

Swinton, *June 15th*, 1926.

Parliamentary News.

[By Our Special Parliamentary Reporters.]

Swindon Corporation Bill.—As briefly mentioned in our last issue, this Bill came before the Unopposed Bills Committee of the House of Commons on June 11th, and was ordered to be reported for third reading. The Swindon Corporation already has powers to wire premises on the condition that the work is done through contractors. The opposition on the part of the contractors to the present Bill was in respect of Clause 51, which proposes to relieve the Corporation of the obligation to employ contractors to wire consumers' premises. It is understood that the question was discussed between the Incorporated Municipal Electrical Association and the Electrical Contractors' Association, and that an agreement was come to with the result that the Bill became unopposed by reason of the insertion of the following provisos in Clause 51:—(*a*) That the Corporation should not sell electrical installations and apparatus except at retail prices; (*b*) That it should not sell any such apparatus to the trade save where there was an electrical contractor of whom the consumer or prospective consumer was a customer or prospective customer, in which case it should sell to the contractor at trade price; (*c*) That if such retail and trade prices were agreed, they should be determined by a committee representative of the interests concerned appointed by the Electricity Commissioners on application; (*d*) That the Corporation should so far as practicable adjust the prices and the charges made for materials provided and work done to meet any expenditure incurred in connection therewith (including interest and sinking fund for repayment of moneys borrowed); and (*e*) That the total sums received and expended by the Corporation should be separately shown in the published accounts.

Bristol Corporation Bill.—The Local Legislation Committee of the House of Commons began the consideration of this Bill on June 9th. One of the objects of the Bill relates to the building of a new power station at Portishead, and Mr. TYLDESLEY JONES, K.C., who appeared for the Corporation, explained that the present power station had reached the limit of its capacity, owing to the lack of condensing water. Consequently the Corporation had decided to build a new power station on land which would allow of the installation ultimately, if necessary, of plant having a capacity of 240,000 kW. It was possible for the Corporation to build the station, with the consent of the Electricity Commissioners, without going to Parliament, but it was the custom to obtain legal powers in order to prevent a public utility authority from being sued for nuisance. A local inquiry had been held by the Electricity Commissioners and among those who sought permission to oppose was the West Gloucestershire Power Co., but it was decided that the Power Co. whose boundaries were some miles away from the boundaries of the area of supply of the Bristol Corporation, had no *locus standi*. When the present Bill was deposited in Parliament the Power Co. lodged a petition and the Corporation objected, but the Court of Referees of the House of Commons had decided that the Power Co. should be heard against the Bill. The case of the Power Co. was that the erection of a new power station by the Bristol Corporation would interfere with the development of its business, although it was impossible to understand how this could be the case. At the present moment the Power Co. had an area of 300 square miles and was making application for additions to that of 590 square miles; at present it had one power station for this huge area containing 10,000 kW and capable of extension to 30,000 kW. Obviously that station could not meet the needs of such an important area as the Power Co. possessed.

Evidence in support of Counsel's statement was given by Mr. H. FARADAY PROCTOR (chief electrical engineer, Bristol).

Before the conclusion of the Corporation's case, it was announced by Mr. CRAIG HENDERSON, K.C. (for the Power Co.), that the company would not continue its opposition. The Corporation intended the station for its own needs, and, in so far as it was a station capable of expansion, the company would leave it to the Electricity Commissioners to decide what the future was to be.

The Committee allowed the clause, and considered that the site was most suitable for the erection of a generating station.

Private Bills.—The Royal Assent has been given to the Ayrshire Electricity Order Confirmation Bill, and to the Ascot Gas and Electricity Bill. The Kidderminster and Stourport Tramways Bill has been read a second time in the House of Commons. The London Electric and Metropolitan District Railway Companies' Bill was read a third time in the House of Commons on June 21st.

Telephone Development.—On June 15th, Sir W. MITCHELL-THOMSON, Postmaster-General, informed Captain Fraser that in the year ended March 31st last, 222,494 telephones were installed. During April, orders were obtained at the rate of over 5,300 per week and at the end of that month, omitting those orders for which subscribers were not then ready for service, there were in hand 13,600 orders, representing less than three weeks' work. At the same date, some 800 applications for service were outstanding which could not be met pending the completion of certain engineering works. Telephone publicity work was carried out by a canvassing staff of about 400 and by the exhibition of posters, the distribution of leaflets and booklets through the post, from Post Office counters and through the agency of canvassers. The wages and commission paid to the canvassing staff in the year 1925-26 amounted to about £136,000, but part of this sum was chargeable to other duties which the staff performed.

Special Orders.—The following Special Electricity Orders have been approved:—Bedford (Extension), East Anglian, Petersfield and District, Wrexham Rural District, and Millom.

Radio Music in Parks.—On June 16th, Col. DAY asked the Under-Secretary of State for the Home Department, as representing the First Commissioner of Works, whether it was proposed to introduce wireless concerts in London parks as a substitute for bands.

Captain HACKING said he could only answer for the Royal Parks. It was not proposed to introduce radio concerts as a substitute for bands in any of those parks.

Cutting off Electric Light.—On June 17th, Sir EVELYN CECIL asked the Home Secretary whether, in the case of an offence against Section 22 of the Electric Lighting Act, 1882, by unlawfully or maliciously cutting or injuring any electric line or work with intent to cut off any supply of electricity, which was punishable as felony and liable to penal servitude or imprisonment, the Home Office took the initiative in prosecuting or, if not, what procedure was adopted.

Sir W. JOYNSON-HICKS said that the normal course, in that as in any other case of felony, would be for the police to take the necessary action on receiving information that an offence had been committed.

Shropshire, &c., Bill.—On June 17th, the Shropshire, Worcestershire and Staffordshire Electric Power Co. Bill came before the Unopposed Bill Committee of the House of Lords, which ordered it to be reported, with amendments, for third reading.

Legal.

Francis Polden & Co., Ltd., v. Murless.

IN the Mayor's and City of London Court, on June 16th, before Judge Shewell Cooper, Messrs. Francis Polden & Co., Ltd., electrical contractors, brought an action against Mr. R. A. Murless, of Waltham St. Lawrence, Berks., for £44 12s., for work done in dismantling a "Delco" electric lighting plant, fitting new parts and re-erecting it. Mr. PAUL, for the plaintiffs, said that the defendant obtained the plant in a bad condition from America, and asked the plaintiffs to re-condition it, and fit his premises throughout with electric lighting. The total value of the contract was about £300. The work was finished in April, and everything was found to be satisfactory. Later the engine broke down, and it was found that the breaking of a split pin had allowed a nut to get loose. The machine was again repaired and put in running order, and the sum claimed represented the cost of new parts and labour expended. The defendant had refused to pay on the ground that when the plaintiffs accepted his original order there was a guarantee that if any breakdown occurred through faulty material or workmanship within six months it would be made good by the plaintiffs. The plaintiffs contended that the breakdown was not due to any fault of theirs. When they were first shown the engine they called in an expert and provided such new parts as, in his opinion, were necessary. With the machine that came from America was the split pin which had been the cause of the trouble, and in the view of the Delco expert it was in a satisfactory condition to be used again. Plaintiffs therefore contended that there was no negligence on their part.

For the defence Mr. KINGHAM submitted that the plaintiffs had not fulfilled their duty in replacing in the apparatus a split pin which it had been admitted had already been used and bent about.

Judge SHEWELL COOPER said that in his view the plaintiffs were bound under the contract to replace any parts of the engine which were defective, but he came to the conclusion that there was no negligence on the part of the plaintiffs' servant in re-fitting the split pin. Under the contract plaintiffs guaranteed not to supply faulty material, and that could only refer to material which they did supply. He gave judgment for the plaintiffs for the amount claimed, with costs.

Theft of Electricity.

AT the Llandilo Police Court on June 17th, John Edwards, a mineral water manufacturer, was charged with feloniously and fraudulently abstracting electricity belonging to the Llandilo Urban Council. Evidence was given showing that the defendant rearranged the wiring of a meter so that the electricity did not pass through the instrument. Defendant pleaded guilty and was fined £50 and costs.

A Welding Arbitration Case.

THE *Western Mail* reports that a Divisional Court, composed of Justices Salter and Fraser, recently heard an application made on behalf of the Cardiff Electric and Oxy-Acetylene Welding Co., Ltd. Mr. Joshua Davies (instructed by Messrs. Capron & Co., agents for Mr. Wilfred Rees, Cardiff) appeared for the applicants; Mr. Wilfred Lewis and Mr. Banks (instructed by Messrs. Higman & Randall) appeared for Alloy Welding Processes, Ltd.

Mr. DAVIES explained that in February of this year Professor Low held an arbitration with reference to a counterclaim by the Cardiff company against Alloy Welding Processes, Ltd., claiming damages in respect of an alleged defective portable welding plant sold to it by the plaintiffs. On February 16th Professor Low published his award, giving the Cardiff Welding Co. £227 damages in respect of its counterclaim. Counsel asked that the award should be remitted on the ground that there was ambiguity with reference to the costs. Mr. Wilfred Lewis argued that there was no ambiguity. The Court granted the application, and remitted the award to Professor Low.

Telephone Official Charged.

AT the Southampton Police Court on June 8th, Arthur J. Squire was sent for trial at the Hampshire Assizes upon a charge of embezzling £35 14s., the moneys of the General Post Office. It was alleged that the amount was collected from telephone subscribers in payment of their accounts.

Theft of Cable.

AT the Edinburgh Sheriff Court on June 14th, David Robertson and James Anderson were charged with the theft of 118 ft. of lead-covered cable belonging to the Edinburgh Corporation. The prosecution stated that the lads burned the cable to separate the lead from the copper and later sold the copper, which was valued at £3, for 8s. 6d. The prisoners were fined £2 each, or in default of payment 20 days' imprisonment.

Conspiracy Charge.

AT Leicester City Police Court, on June 18th, the hearing was resumed on charges of conspiracy against Charles Cohen, merchant, Dalston, and Leonard Louis Weiner, tailor's apprentice, London, E., who were accused of obtaining quantities of goods by means of forged references. Among the witnesses was Mr. W. Mills, secretary of Messrs. E. Brook, Ltd., electrical engineers, Empress Works, Huddersfield, who stated that Weiner & Co., of Leicester, wrote for quotations and afterwards ordered electrical machinery. References were asked for and given, and Messrs. Brook wrote to "Douglas Armstrong & Co.," and "Wm. Courtney & Co.," both of London, who replied stating that they had had dealings with Weiner & Co. and had found them quite satisfactory, being good for credit up to £500 per month. Messrs. Brook thereupon despatched to Weiner & Co. electrical machinery to the value of £38 and £29, for which they had never received payment. Evidence was given by Ralph Barcon, Highbury, N., formerly trading as Courtney & Co., that he had no knowledge of the reference produced, and had never signed such a document. His firm had no agents in Paris, Dresden and Cologne, as stated on the notepaper. The accused were remanded for a week, Cohen being refused bail, and Weiner being granted bail in the sum of £250, which was forthcoming.

Reviews.

Dictionary of Costing. By R. J. H. RYALL, F.C.W.A., with a foreword by Sir George Beharrell, D.S.O. Pp. xiii + 377. London: Sir Isaac Pitman & Sons, Ltd. Price 10s. 6d. net.

If the author had consulted the Oxford Dictionary, he might have chosen a different title for his book.

"The author's aim has been to produce a work which shall take its place as the standard book of reference in the costing profession." Truly, a huge task for one man to undertake, especially when he himself admits that vast strides have been made in the science of costing during the past few years. We are surprised, therefore, in handling the book for the first time, that it contains less than 400 pages of clear type. Surely this does not cover the whole ground of costing, as we should expect a standard book of reference to do. Again, are not vast strides still being made? We are fearful lest this standard book should very shortly suffer from obsolescence. However, here is a definite attempt to do what has been so obviously needed in the past few years; to collect data from all industries and from the practice of many cost accountants; and it should, at least for the present, give a fair indication of standard practice in the application of costing.

We are inclined to think that the authorship approaches editorship in this case, as there seem to be traces of many hands having made their contribution to the definitions and descriptions included. Naturally, such a book is received with hopeful, yet fearful anticipations, and one must confess that in the treatment of most of the subjects there is a thoroughness and a lucidity which make the book very readable, despite its encyclopædic form.

That the book is up to date is illustrated by the fact that there is described in it the "Paramount Sorting System," which seems to be destined to have a drastic influence upon the costing methods in vogue in many firms which cannot afford the more expensive machinery made for the same purpose.

The Institute of Cost and Works Accountants in 1923 issued a paper upon "Standardisation in Cost Accountancy," which constituted an authoritative pronouncement upon costing terminology, and we are frankly surprised that the author, a member, and a prominent member, of that body, should see fit to set up in some degree a new terminology of his own. Admittedly it is only in a very few terms that he goes astray, such as the use of "Factory Expense" instead of "Manu-

facturing Expense," and it may seem rather a quibble to suggest that this is a vital error, but if this is meant to take the place of the paper quoted, as a more comprehensive survey, it appears to us that a rigid adherence to the prime authority is most necessary.

The book is profusely illustrated with forms, tables and formulæ, which are very clear, and will repay the close study of cost accountants, engineers, and students. Nevertheless, it must be pointed out that such a book is bound to cover far more ground than is required in a small business, employing up to, say, 500 men. This is given in warning rather than condemnation, for, as far as the bigger firms are concerned, we can recommend it as a book of reference, subject to the qualifications already stated. No doubt, as times and customs change, the author will see to it that revised (and, we expect, enlarged) editions will be forthcoming.

This is not a text-book. It is a book of reference, and therefore certain subjects are not treated so exhaustively as they would have been in a text-book, or in a more specialised treatise; but the amount of ground covered is far more than has been covered in any book on costing published in this country. Used in conjunction with such text-books as can be relied upon, its value will easily be appreciated.

The last paragraph of the preface is arresting. If this book will do anything to wake up the vast majority of our manufacturers, who so sublimely think that their own antiquated, home-made, expensive, and inefficient methods bear some resemblance to sound systems or even justify the expense incurred in their upkeep, it will have been supremely " worth while."

Loud Speakers : Their Construction, Performance and Maintenance. By C. M. R. BALBI, A.M.I.E.E., A.C.G.I. Pp. xv+96; figs. 57. London : Sir Isaac Pitman & Sons, Ltd. Price 3s. 6d. net.

There is a considerable amount of scattered literature in the form of lecture reports and magazine articles on the subject of loud speakers, but singularly little has appeared so far in a comprehensive form.

This is all the more surprising as it has been recognised for some time that telephone reception for broadcast listeners will soon be confined almost wholly to crystal sets, and Mr. Balbi's little book would for this reason alone be sure of a warm welcome. But it deserves a welcome for other reasons as well, for it is accurate, concise, up-to-date, and as comprehensive as its size permits. The contents include short descriptions of the principles on which every loud speaker of note is constructed, how loud speakers are tested, and what points should be considered when purchasing one; and, in addition, there is a chapter on public address systems. A good summary is given of the outstanding practical characteristics of the various types of loud speakers on the market and the size of the room for which each particular type is suited.

The author sets out to give " an outline of our present-day knowledge in regard to loud speakers in all its branches," and he succeeds admirably, but we must remember that it is essentially an outline, and must not expect any deep delving into a subject which has so many interesting and little-understood depths. In fact the only criticism of the book we offer is that we should have liked more of it.

This little book should prove of considerable practical value to radio manufacturers, traders, and amateur experimenters.

Pyrometers. By EZER GRIFFITHS, D.Sc. Pp. xi+126; figs. 49. London : Sir Isaac Pitman & Sons, Ltd. Price, 7s. 6d. net.

The author of this work gives an account of the most recent developments in temperature-measuring appliances, and deals with the methods of testing and calibrating such apparatus. It is assumed that the reader has made himself familiar with the details of standard apparatus, either by actual experience with these, or by the perusal of makers' catalogue matter. The descriptive portions of the book accordingly deal with special problems in temperature measurement rather than with the most usual apparatus, at any rate, as far as electrical pyrometers are concerned. The portions of the book dealing with the calibration of pyrometers are both interesting and useful.

The opening chapter deals with the important matter of the establishment of a scale of temperature covering the range of industrial requirements. The problem of practically realising the basic thermodynamic scale has been no easy one. The constant volume hydrogen thermometer gives an exceedingly close approximation to the theoretical scale between 0 deg. and 100 deg., whilst the platinum-resistance thermometer scale gives sufficient exactness between the freezing point of mercury and the boiling point of sulphur when standardised at 0 deg. and 100 deg. A number of fixed points ranging from the boiling point of oxygen and the melting point of copper have been established with considerable precision. The calibration of expansion thermometers is dealt with in the second chapter, and the methods of comparison with standards between the limits −80 deg. and 450 deg., are described in detail. There is an interesting account of the problem of measuring surface temperatures. Thermo-electric pyrometers are amply treated and good information is given of the various combinations available for different circumstances. A good description is here given of the recording potentiometer type of thermo-electric instrument. The chapter dealing with resistance thermometers describes the application of this method to the measurement of the temperature of electric cables and of transformer windings. Various types of the disappearing filament optical pyrometer are described, and the theory of this instrument is briefly summarised. A short chapter on the total radiation instrument and an account of some typical electric furnaces for recent investigation work conclude the book.

A useful feature of the work is the reference made to standard text books for the benefit of readers desiring to acquaint themselves with the elementary theory of the instruments described. There is also a list of references to advanced text books and to original papers for those wishing to pursue the subject beyond the limits of the present work. Dr. Griffiths's book will be useful to those requiring a good general account of the present state of the science of temperature measurement, and also to electrical power engineers who have instruments for this purpose under their control.

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1924.

29,372. " Magnetic separators." H. S. Hatfield. December 8th, 1924. (242,034.)

29,554. " Electrical protective arrangements for alternating-current systems." N. F. Hinton and Metropolitan-Vickers Electrical Co., Ltd. December 9th, 1924. (252,036.)

29,808. " Electric furnaces." G. Evreynoff. December 11th, 1924. (252,037.)

1925.

541. " Telephone systems." Standard Telephones & Cables, Ltd. (formerly Western Electric Co., Ltd.) (G. Deakin and L. Polinkowsky). January 8th, 1925. (252,041.)

1,107. " Electric apparatus for indicating and recording quantities at a distance." S. A. Fox and C. H. Offord. January 14th, 1925. (252,049.)

1,269. " Electromagnetic sound recording and reproducing mechanism." H. P. O'Reilly. January 15th, 1925. (252,214.)

3,515. " Automatic telephone exchanges." P. C. Rushen (C. Lorenz Akt. Ges.). February 7th, 1925. (252,052.)

3,629. " Electromagnetic sound recording apparatus and record produced thereby." A. F. Sykes. February 9th, 1925. (Cognate application 12,581/25.) (Patent of addition not granted.) (252,228.)

3,646. " Acoustic amplifying and radiating means." E. A. Graham. February 9th, 1925. (252,053.)

3,866. " Automatic telephone switching apparatus." Standard Telephones and Cables, Ltd. (formerly Western Electric Co., Ltd.) (G. Deakin and L. J. J. Schreiber). February 11th, 1925. (252,056.)

3,867. " Automatic telephone switching apparatus." Standard Telephones and Cables, Ltd. (formerly Western Electric Co., Ltd.) (G. Deakin and L. J. J. Schreiber). February 11th, 1925. (252,057.)

4,006. " Electric alarm systems." F. E. J. Horn and O. Schoppe (firm of). February 12th, 1925. (252,229.)

4,007. " Means for controlling rotating field motors." H. Wade (Nederlandsche Technische Handel Maatschappij Giro). February 12th, 1925. (252,060.)

4,088. " Production of telephonic diaphragms and the like." W. J. Palmer. February 13th, 1925. (252,062.)

4,097. " Electric remote-control systems, more particularly for use in controlling or supervising the apparatus at an electric power sub-station." Automatic Telephone Manufacturing Co., Ltd., and A. E. Hudd. February 13th, 1925. (252,230.)

4,098. " Control of apparatus at an electric power sub-station from a central control office." Automatic Telephone Manufacturing Co., Ltd., and C. Remington. February 13th, 1925. (252,231.)

4,192. " Protective devices for electric traction systems." British Thomson-Houston Co., Ltd., and H. S. Holbrook. February 14th, 1925. (Cognate application 4,193/25.) (252,069.)

4,225. " Plug-and-socket electric couplings." J. J. Rider. February 16th, 1925. (Cognate application 28,589/25.) (252,233.)

4,338. " Electric lamps for illuminating bakers' ovens." F. T. Bouckley. February 17th, 1925. (252,235.)

4,377. " Variable-inductance devices." Igranic Electric Co., Ltd., and S. R. Wright. February 17th, 1925. (252,236.)

4,415. " Apparatus for automatically reclosing electric circuit-interrupters." T. W. Ross and Metropolitan-Vickers Electrical Co., Ltd. February 17th, 1925. (252,238.)

4,421. " Manufacture of wires and tapes for loading telephone conductors." W. S. Smith and H. J. Garnett. February 17th, 1925. (252,074.)

4,527. " Four-electrode valves and means for obtaining high-frequency or low-frequency magnification or rectification therewith." Marconi's Wireless Telegraph Co., Ltd., and E. W. B. Gill. February 18th, 1925. (252,079.)

4,546. " Polyphase induction machines." Siemens-Schuckertwerke Ges. February 19th, 1924. (229,710.)

4,625. " Automatic and semi-automatic telephone systems." Siemens Bros. and Co., Ltd., and H. E. Humphries. February 19th, 1925. (252,244.)

4,626. " Automatic and semi-automatic telephone systems." Siemens Bros. and Co., Ltd., and G. E. Humphries. February 19th, 1925. (252,245.)

4,631. " Dynamo-electric machines." British Thomson-Houston Co., Ltd., and F. P. Whitaker. February 19th, 1925. (252,246.)

4,751. " Apparatus comprising a combined resistance and capacitance." British Thomson-Houston Co., Ltd., and H. S. Holbrook. February 20th, 1925. (252,083.)

4,877. " Polyphase induction machines." Siemens-Schuckertwerke Ges. May 1st, 1924. (Addition to 229,710.) (233,310.)

5,130. " Transmitting or receiving aerial systems for wireless telegraphy or telephony." C. S. Franklin. February 24th, 1925. (252,272.)

5,216. " Dynamo-electric machinery." E. P. Hill and Metropolitan-Vickers Electrical Co., Ltd. February 25th, 1925. (252,277.)

5,450. " Telephone systems." Standard Telephones & Cables Ltd. (formerly Western Electric Co., Ltd.) (Western Electric Co., Inc.). February 27th, 1925. (252,088.)

5,571. " Electrical relays." T. W. Ross, C. Ryder, and Metropolitan-Vickers Electrical Co., Ltd. February 28th, 1925. (252,089.)

5,936. " Tuning of wireless circuits, and apparatus therefor." R. J. T. Morton and B. Stirling. March 4th, 1925. (252,285.)

19,470. " Shock-absorbing devices for thermionic valves." Benjamin Electric, Ltd. August 2nd, 1924. (237,921.)

27,981. " Electric machines for working under liquid." Siemens Schuckertwerke Ges. November 7th, 1924. (242,660.)

30,840. " Casings for electric transformers and the like." O. Wehrle. December 7th, 1925. (252,299.)

31,747. " Electrical current-generating apparatus for electrical treatment or working upon metals." Elektrotrennmaschinen Ges. February 13th, 1925. (247,527.)

31,993. " Electric current-generating apparatus for electrically treating or working upon metal." Elektrotrennmaschinen Ges. June 16th, 1925. (Addition to 247,527.) (252,302.)

1926.

1,148. " Electric machines for working under liquid." Siemens-Schuckertwerke Ges. April 27th, 1925. (Addition to 242,660.) (251,237.)

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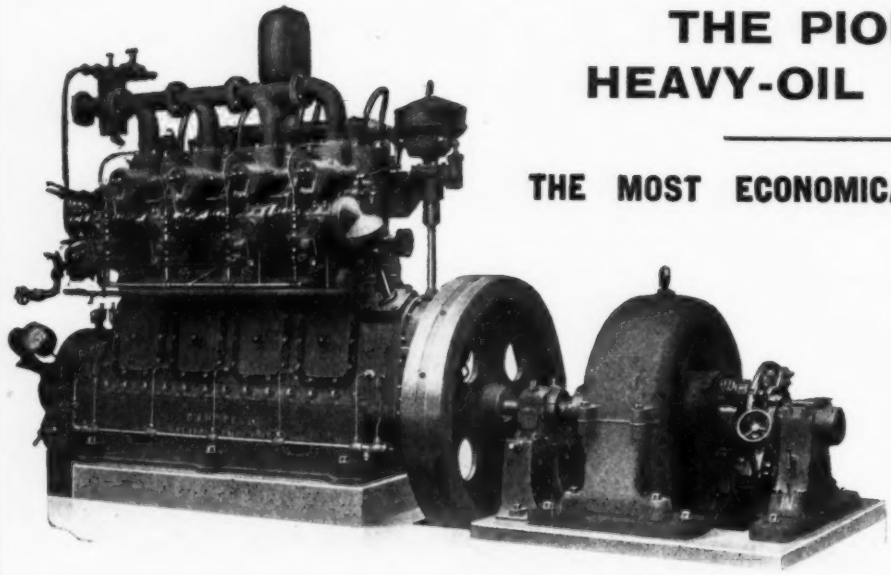

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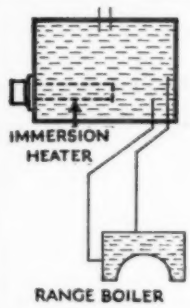
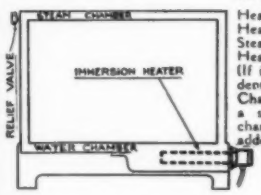
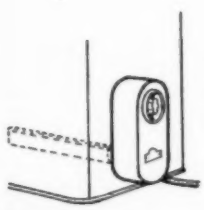


SUGGESTION 1
Heatrae Immersion Heater fixed in existing Hot Water Tank.



SUGGESTION 2
Heatrae Immersion Heater fixed in Steam or Water Heated Hot Closet. (If insufficient depth in Water Chamber at bottom a small auxiliary chamber can be added as shown.)



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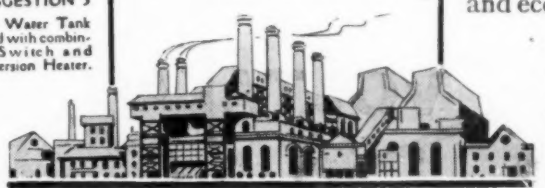

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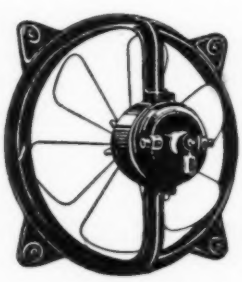

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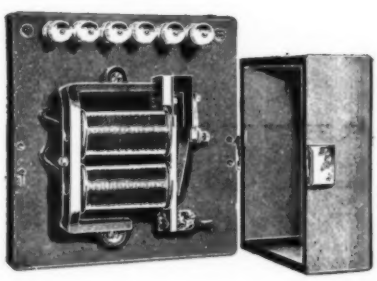

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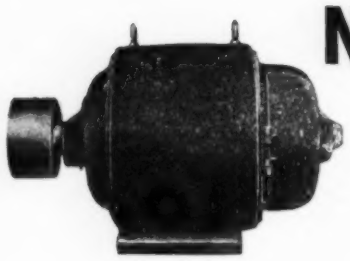

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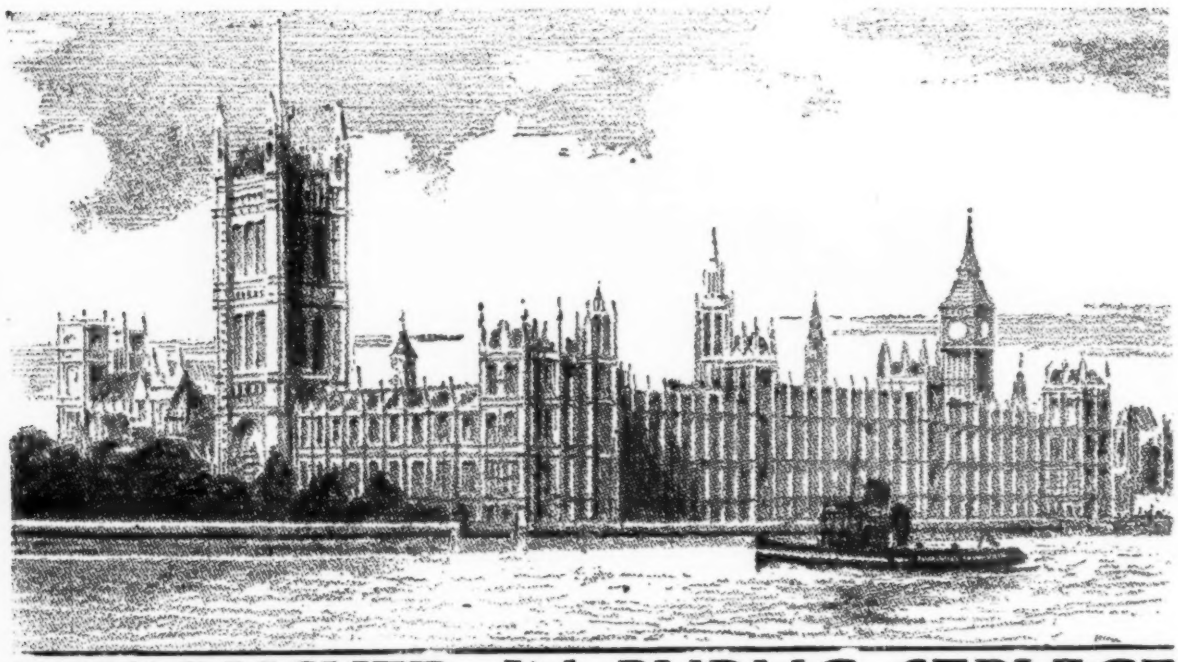

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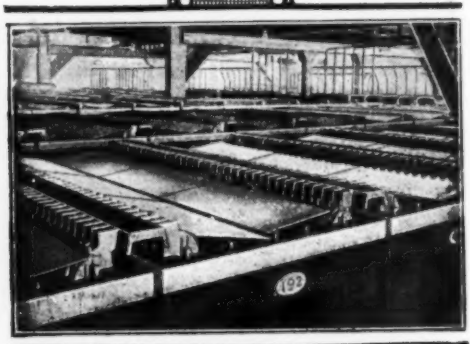

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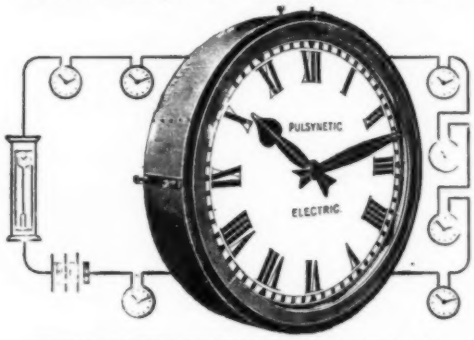

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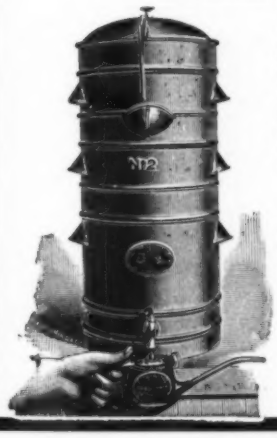

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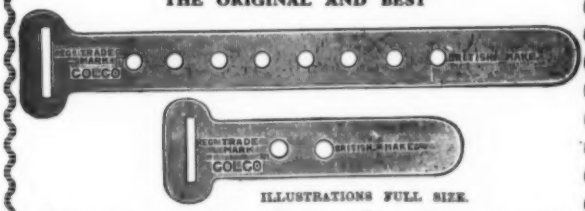

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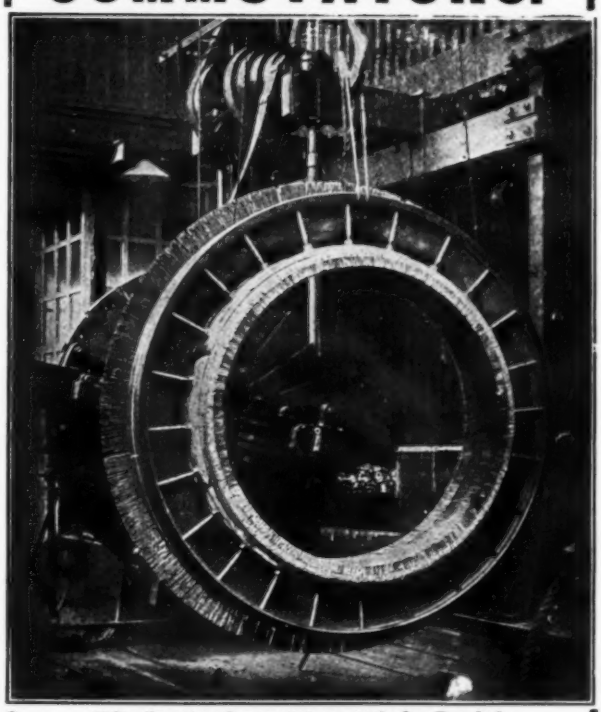

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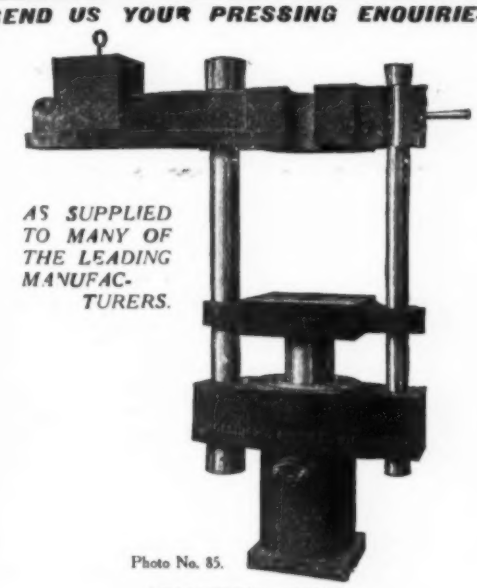

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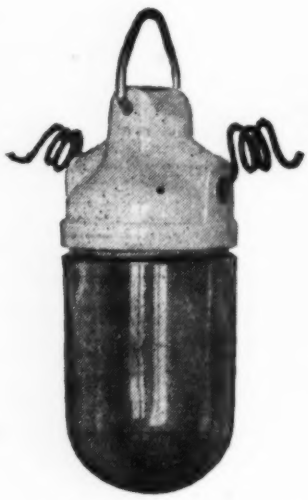

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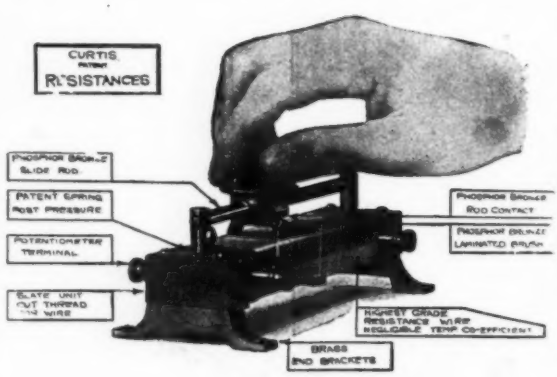

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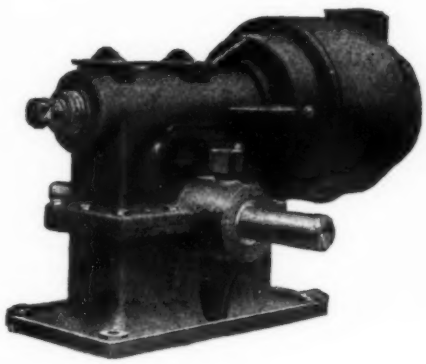

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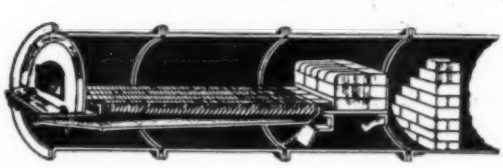

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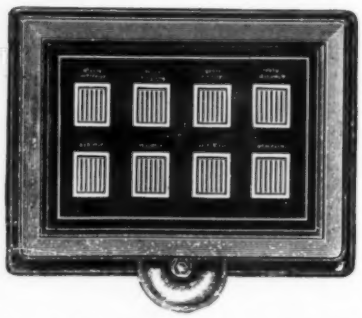

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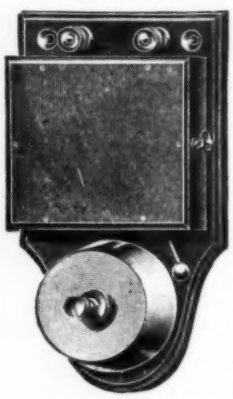

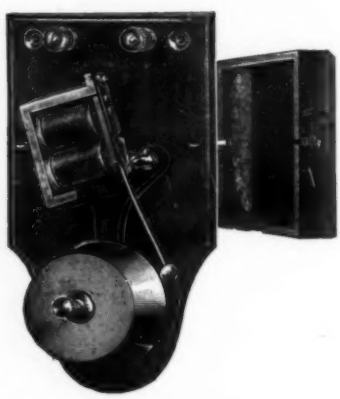

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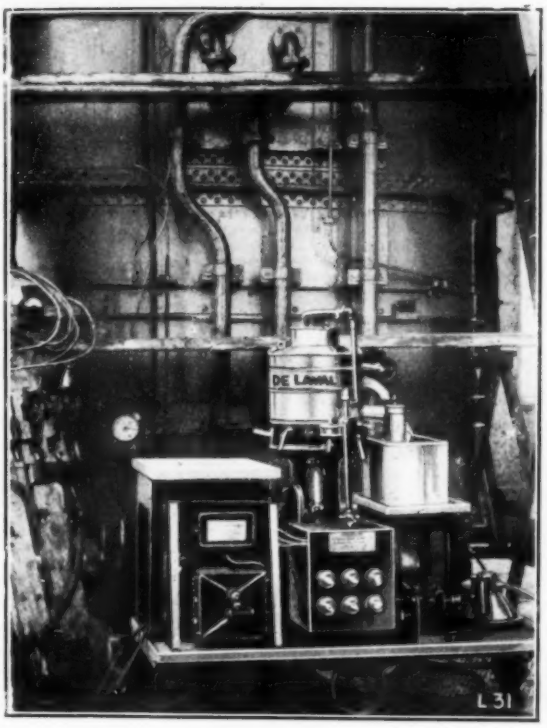

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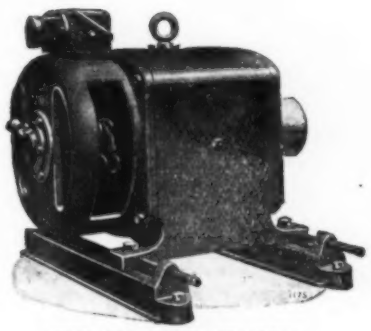

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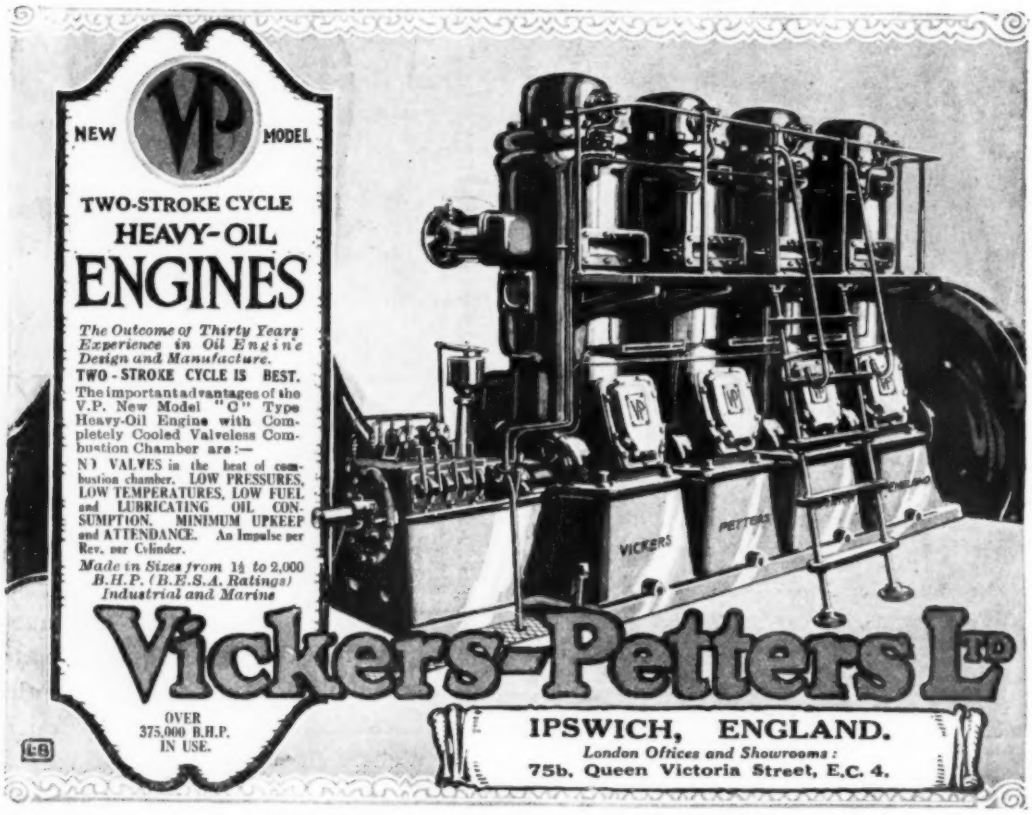
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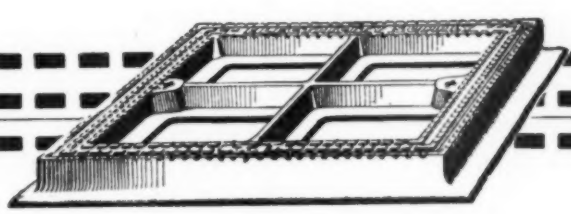

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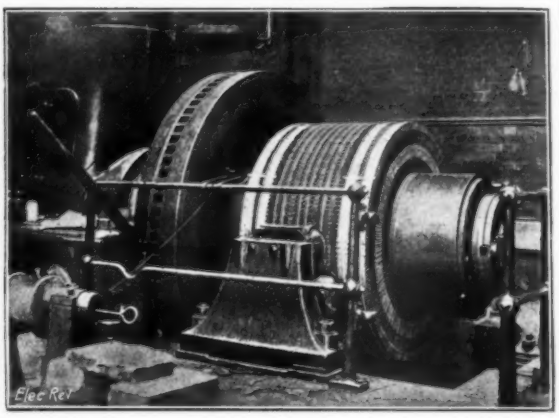

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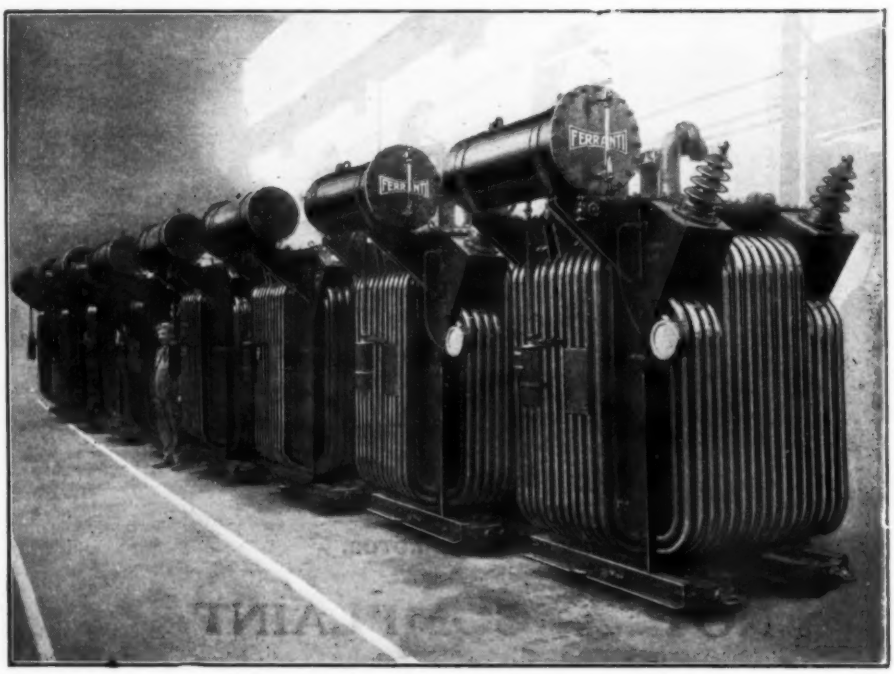

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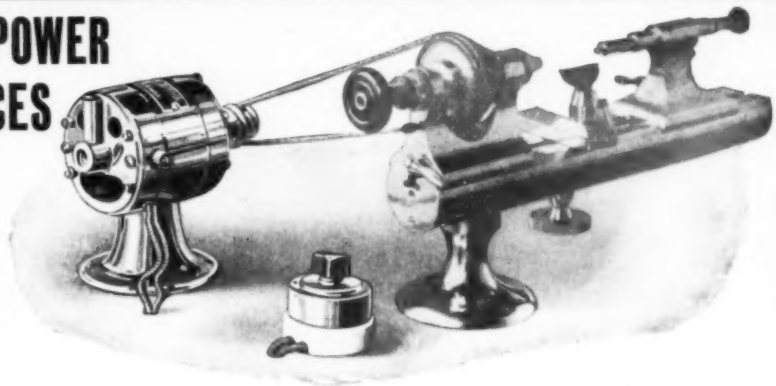

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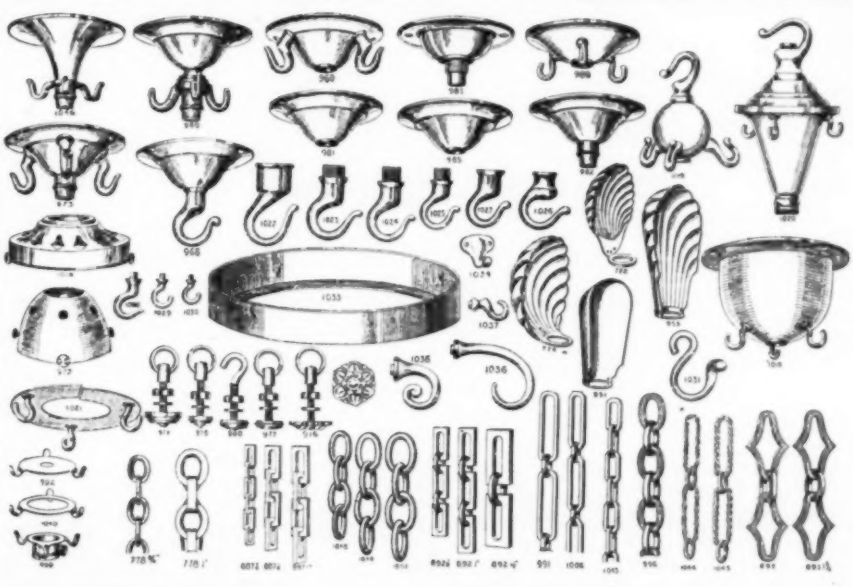

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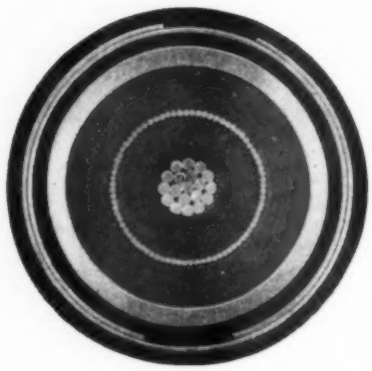

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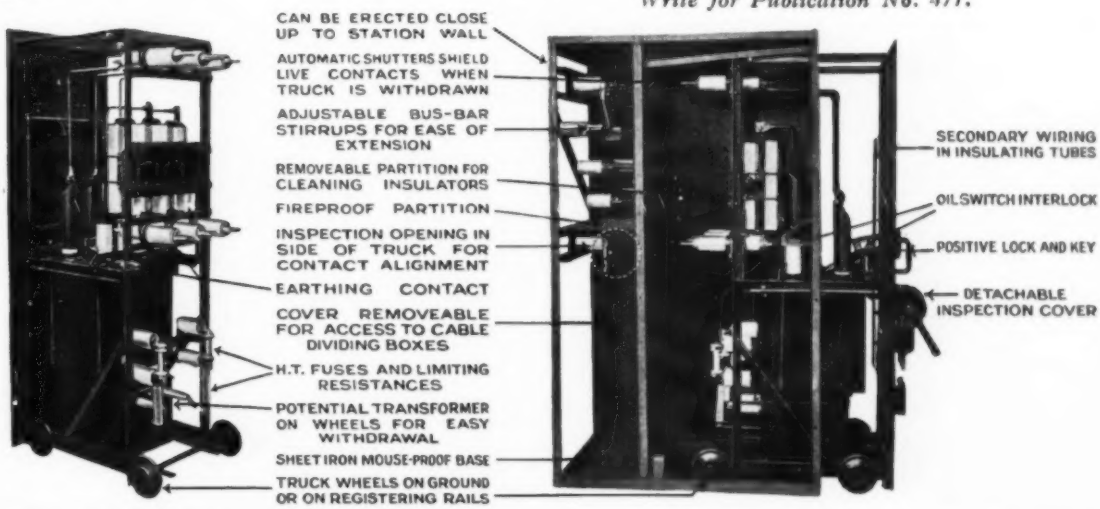
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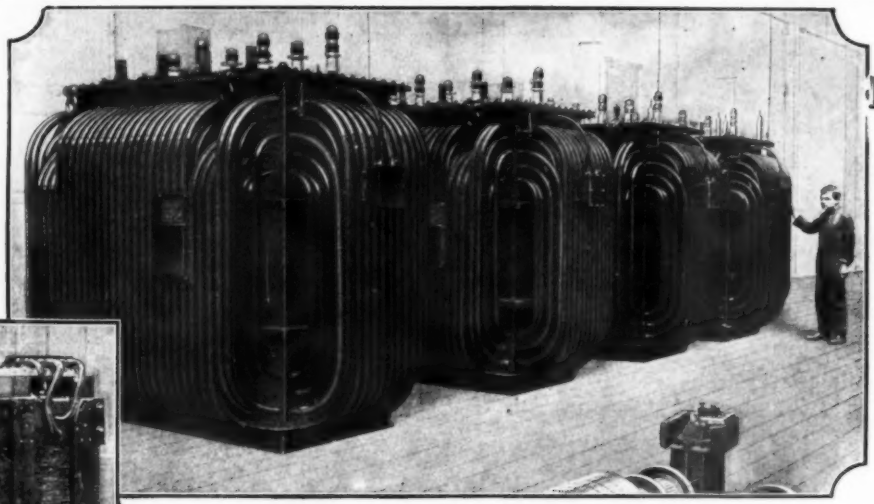

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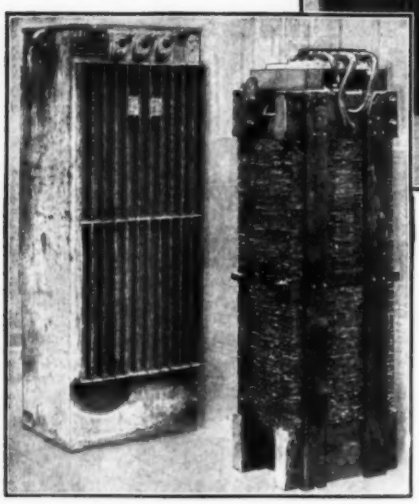

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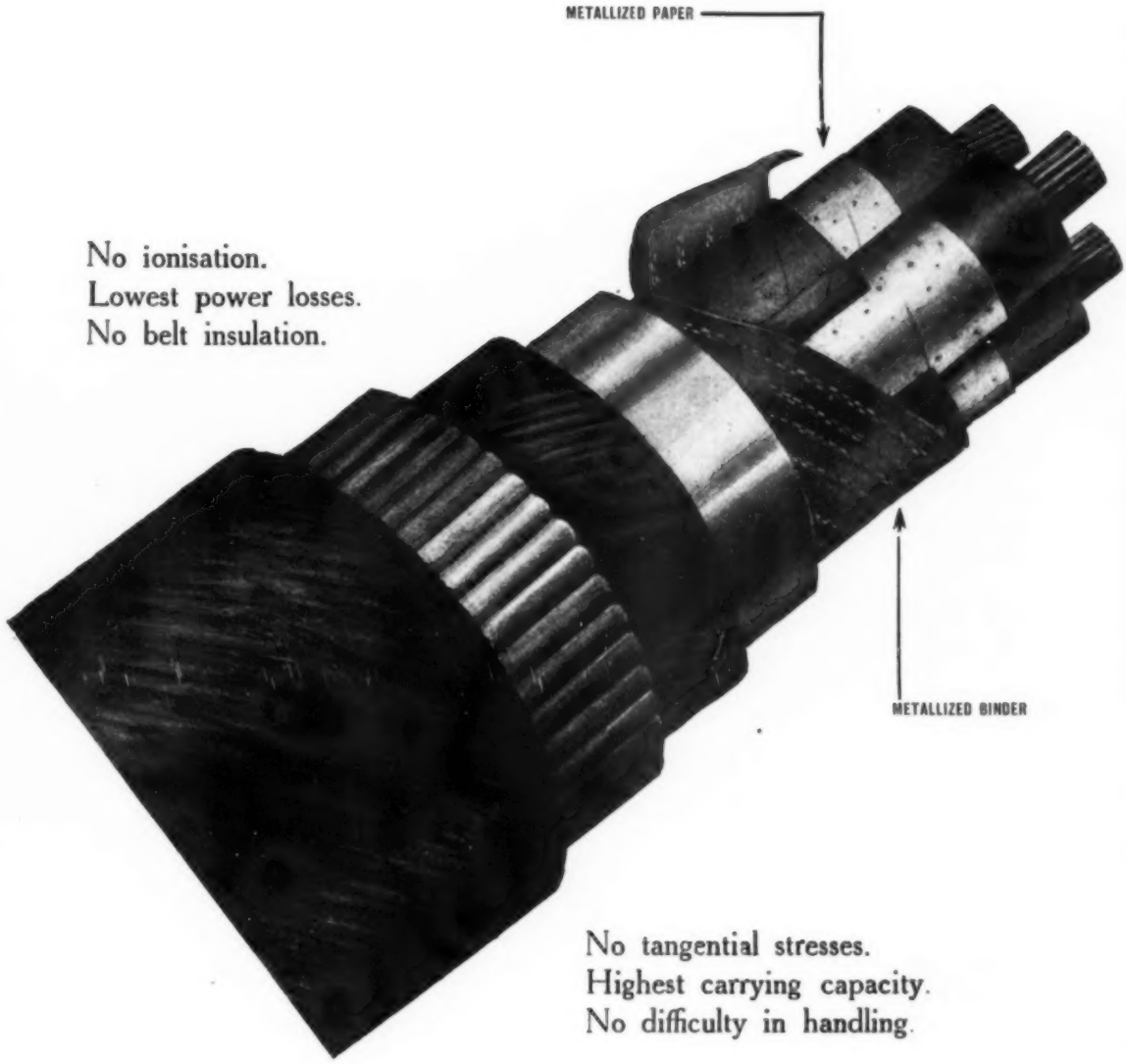

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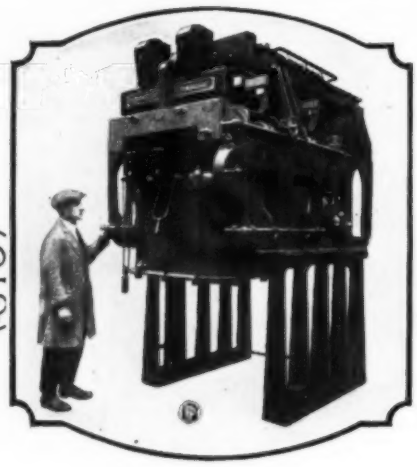
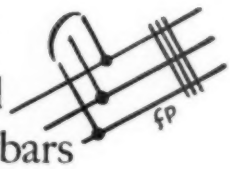
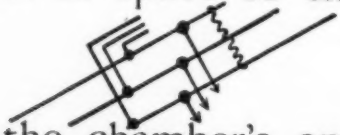
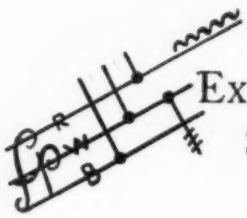


Sing a song of Switchgear
The chambers full of oil
Transformers and the bus bars
Sealed in space so small.





When the chamber's opened
You'll not fail to see
Extensions are so easy
So specify "F.P."



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No. 2.

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Sound engineering design, economy in floor space, the damp and vermin-proof features and unique operating facilities all combine to maintain and extend the confidence and popularity enjoyed by this gear.

Our top illustration shows type HVD Duplicate Busbars electrically operated Unit in the operating position.

We invite you to read our latest brochure, "Metalclad Switchgear— Its Advantages and Characteristics," a copy of which will be sent on request, and which deals with the choice of switchgear from an engineering and scientific standpoint.

The following is a list of the chapter headings in this new brochure:—

1. The Evolution of Switchgear.
2. The Electrical and Mechanical Advantages of Metalclad Switchgear.
3. Distinctive Features of Ferguson - Pailin Design.
4. General Description of Gear.
5. Types of Units with current and voltage ratings.
6. Outlines of Various Units.

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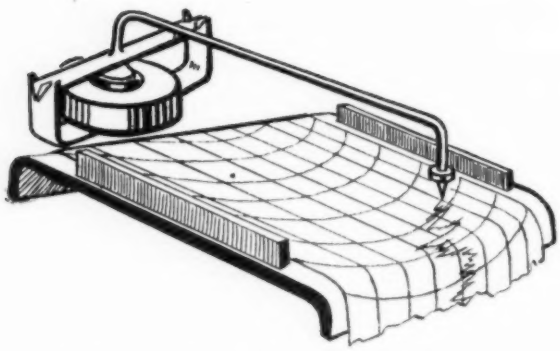

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BRITISH INSTRUMENTS FOR BRITISH INDUSTRIES.

The "ORBIT" REGD.

OSCILLATING PEDESTAL & BRACKET FAN

(Patented all over the World).

12 INCH BLADES.

Sold to and by the Trade

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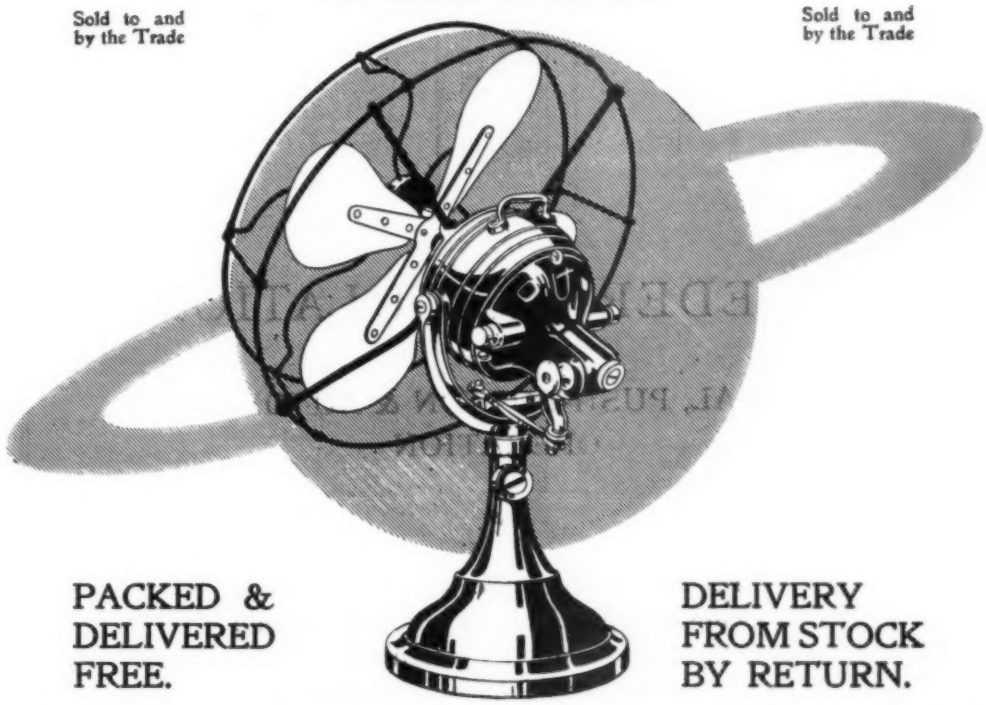

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THE NEW FAN WITH THE ELLIPTICAL TRAVERSING MOVEMENT.
"THE BREEZE IS HERE, THERE, AND EVERYWHERE."

As the blades revolve there is a double oscillating movement, part horizontal and part vertical, so that the circuit of oscillation forms an ellipse, consequently the fanning range is greater than that of any other fan.

The Body and Guard of the Fan is highly finished in Black Enamel with Gold Lines, the Blades being finished imitation Gilt and Lacquered.

The low current consumption of 45 watts makes the "ORBIT" Fan very economical to run, and the full speed of approximately 1500 r.p.m. can be reduced by means of the three speed regulator which is fitted in the Base of the Fan.

The A.C. Fan Motor is of the induction type.

DIRECT CURRENT.		PRICE.	ALTERNATING. 50 PERIODS.	
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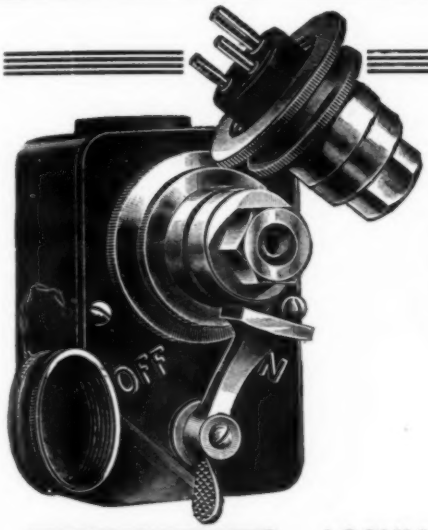

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WATERPROOF COMBINED INTERLOCKING PLUG and SWITCH

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Iron base screwed ¾-in. electrical conduit thread, with 3-pin plug (two pins and earthing pin), waterproof pattern. The plug is enclosed in gun-metal, fitted with cord grip to take "Cab Tyre" or our "Anti-Shock" Flexible Cord. A cap, fitted with a chain, protects the current-carrying parts when plug is out.

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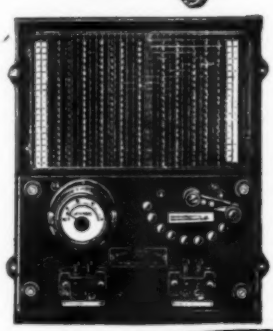

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On all sizes current regulation can be obtained from maximum current to 1/10 maximum current, thus a 7-amp. charging board enables current regulation from 7 ampere to seven amperes.

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ROBUST DESIGN. NEAT APPEARANCE.

SINGLE Pole	5 amps. cap.		1 way	5/6
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Drilled and tapped 1-way ½-in. Gas or ⅝ in. or ¾-in. Conduit, no extra charge.

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Also at LONDON & GLASGOW.

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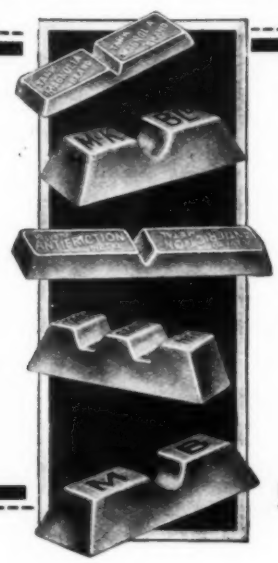

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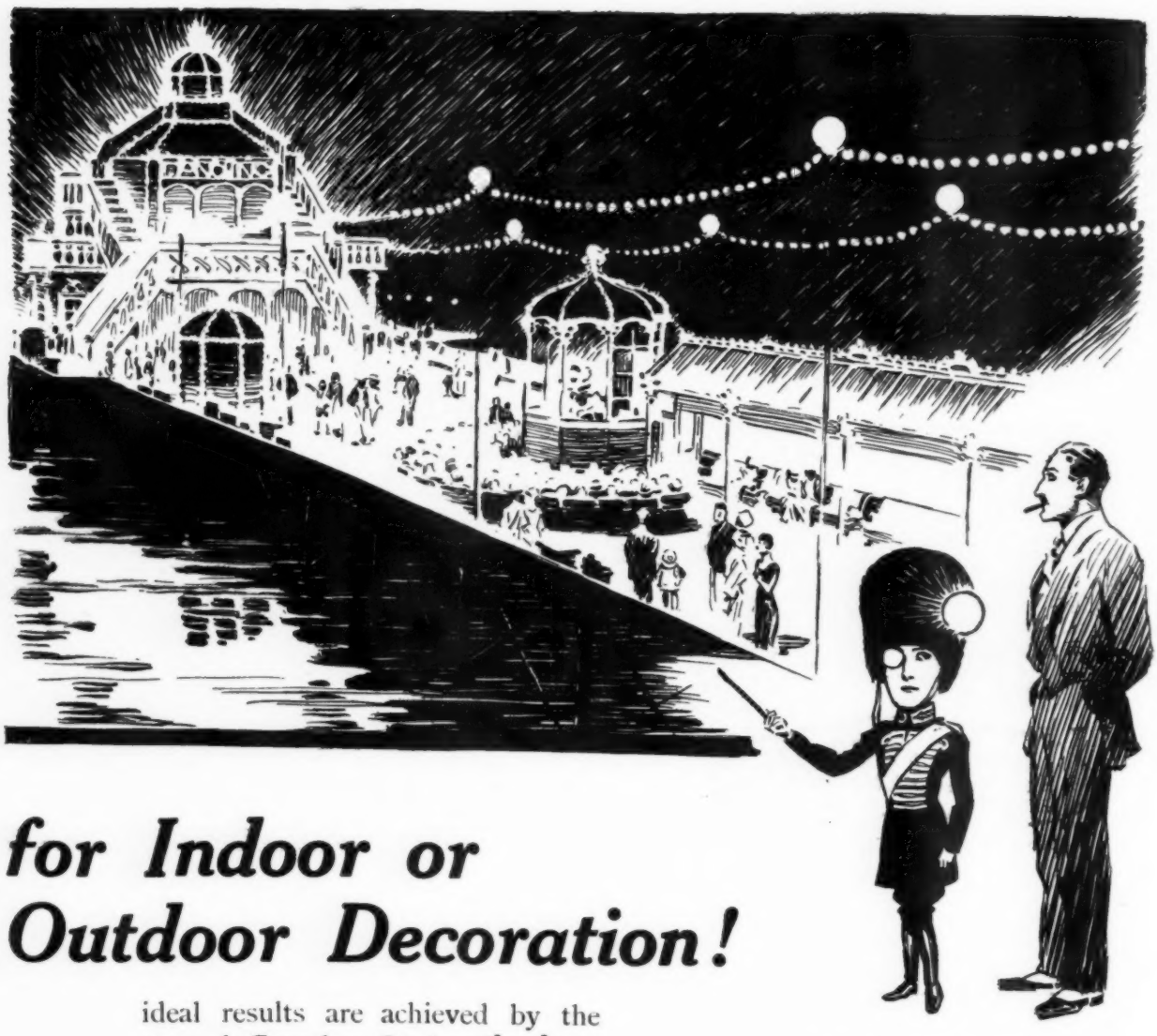

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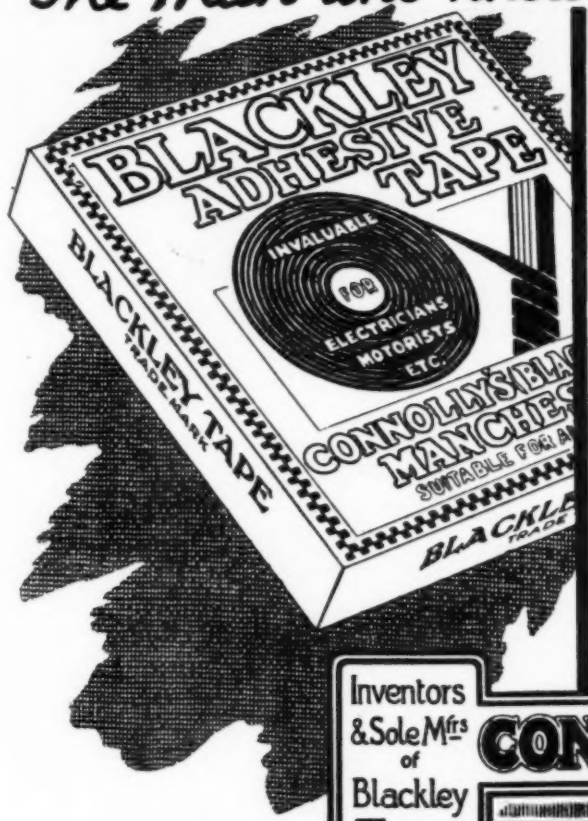

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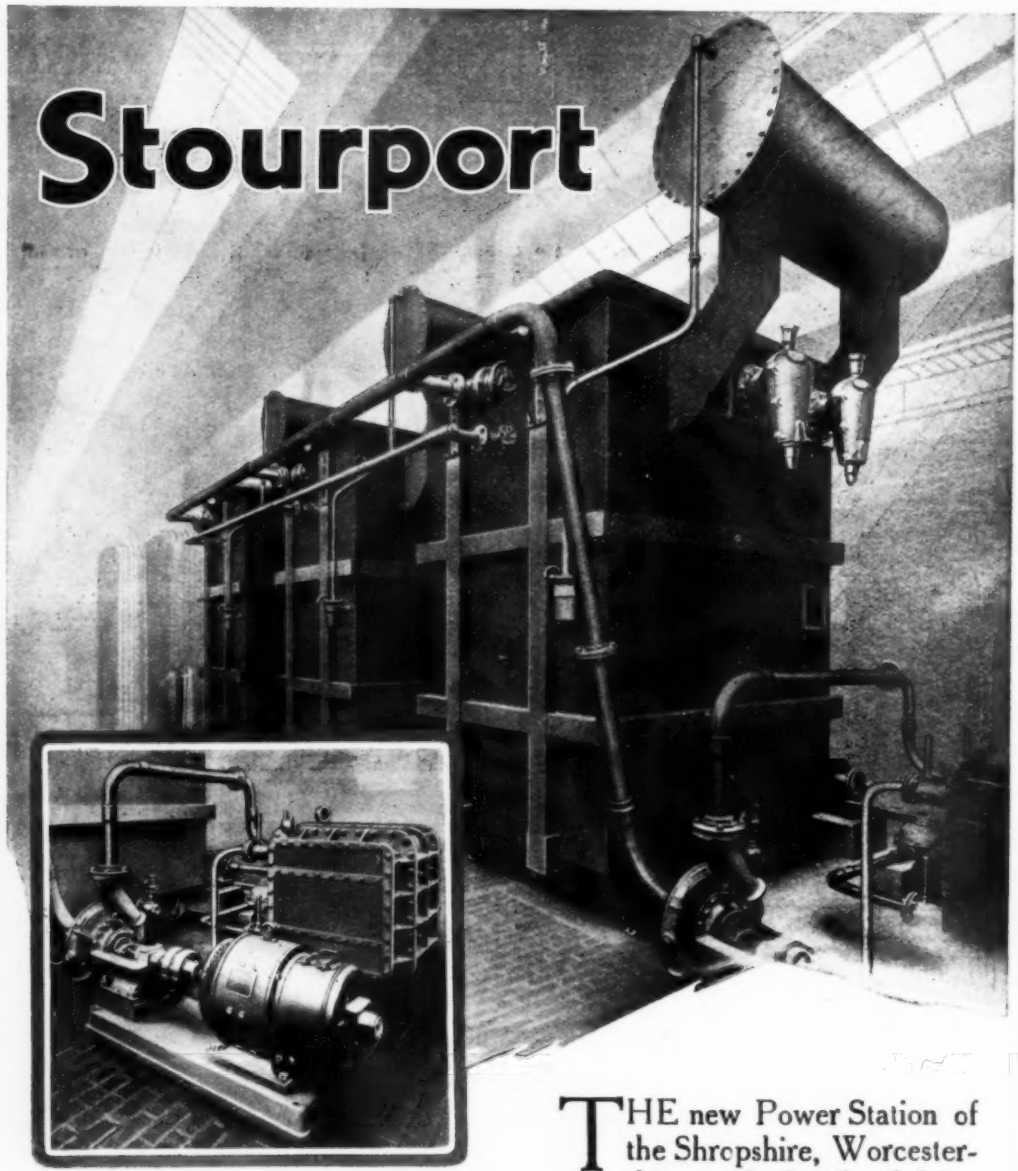

THE ILLUSTRATIONS SHOW :—

(i). *One of the 22,500 kVA banks of "Metrovick" Transformers for Stourport on test at Trafford Park.*

(ii). *One of the four oil-cooling equipments.*

THE new Power Station of the Shropshire, Worcestershire and Staffordshire Electrical Power Co., at STOURPORT, is equipped with two 3-phase banks of "METROVICK" Transformers, each with a capacity of 22,500 kVA, "stepping up" from 5,550 V to the distribution pressure of 33,000 V. Two oil-cooling equipments accompany each bank of transformers.

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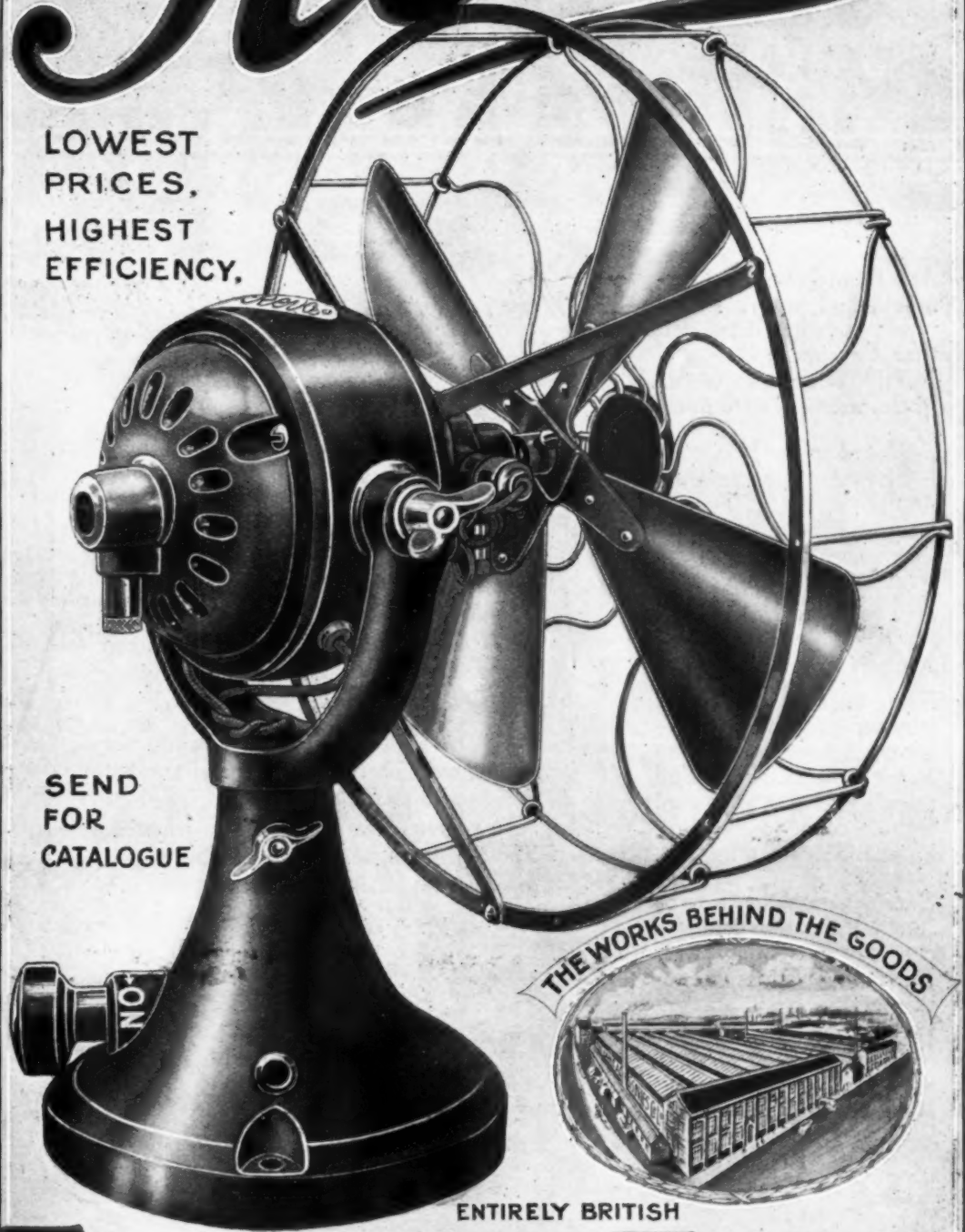

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Ask those who have run PARKINSON Motors for years

Ask them how the bearings stand up to heavy work and they'll tell you that Parkinson Ball and Roller Bearings *never* give a moment's trouble.

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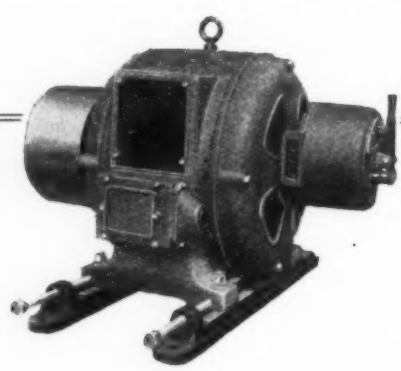
Yours faithfully,

The SOUTH WALES CANISTER CO. Ltd."



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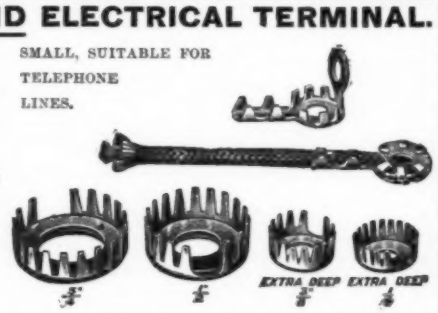

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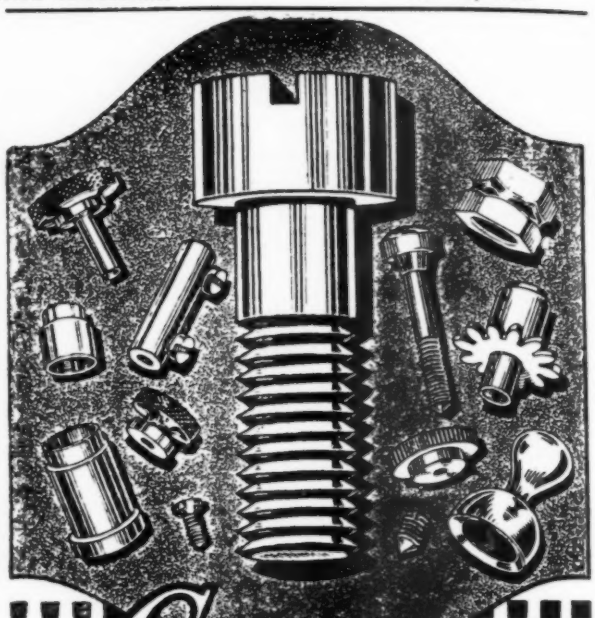

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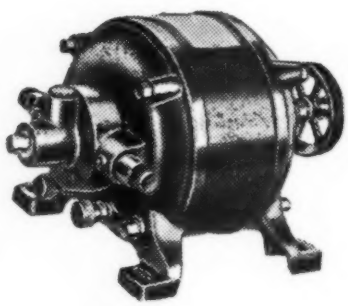

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PRICES QUOTED ON APPLICATION.

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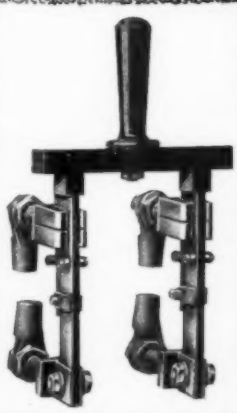

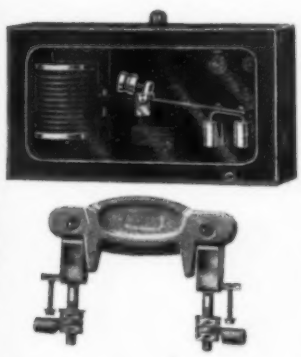

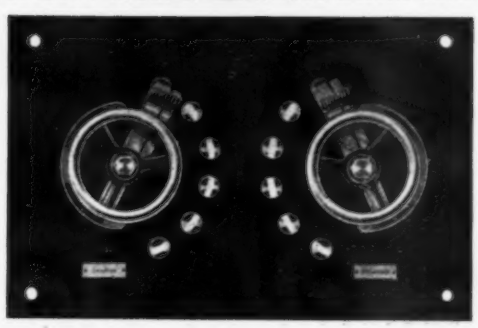

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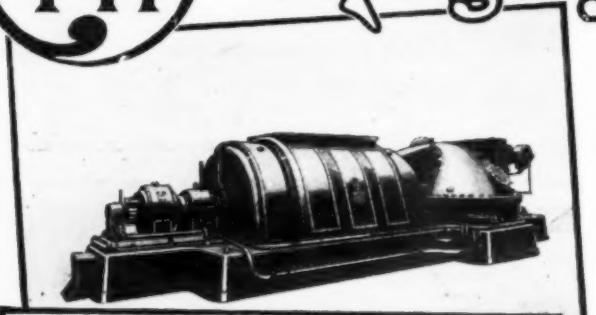
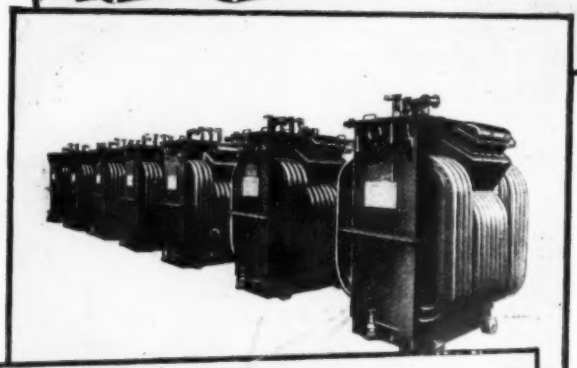
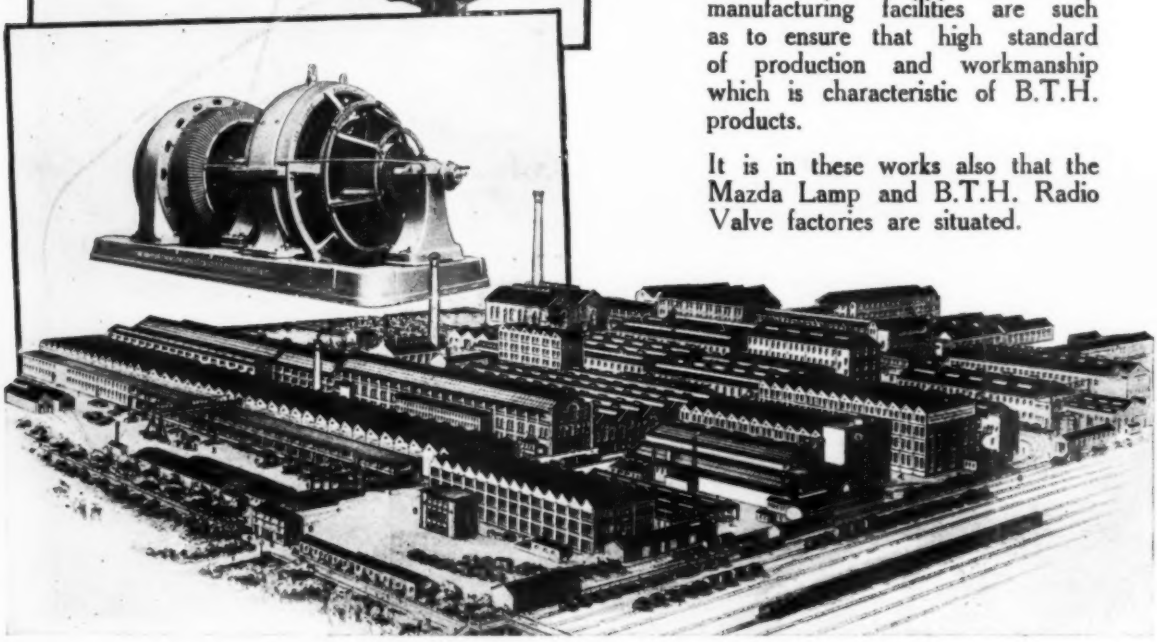
Rugby Works







for **Heavy Electrical Plant, Traction Equipments, Mazda Lamps and B.T.H. Radio Valves.**

The B.T.H. Rugby Works, which are illustrated below, are devoted to the production of all types of heavy electrical plant and turbine-driven machinery.

Separate shops are devoted to the different types of plant and, throughout the entire works, the manufacturing facilities are such as to ensure that high standard of production and workmanship which is characteristic of B.T.H. products.

It is in these works also that the Mazda Lamp and B.T.H. Radio Valve factories are situated.

The British Thomson-Houston Co., Ltd.

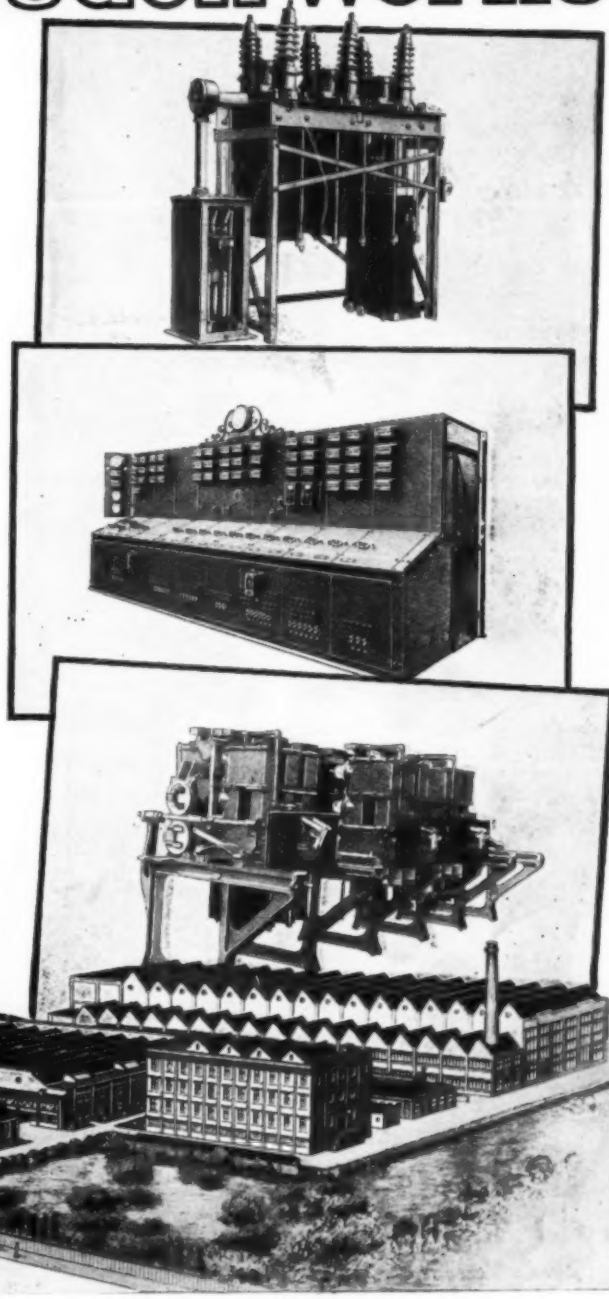
ELECTRICAL ENGINEERS AND MANUFACTURERS

Head Office: Rugby, England. London Office: "Crown House," Aldwych.

Works: Rugby, Birmingham, Willesden, Coventry and Chesterfield.

B T-H Willesden Works

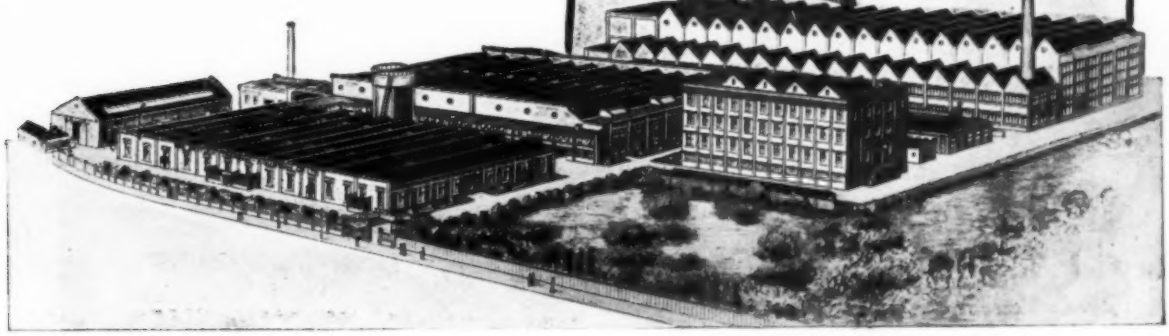
for Switchgear



The B.T.H. Willesden Works, shown in the illustration, are devoted entirely to the manufacture of switchgear.

These works produce all types of switchgear for Municipal and Railway purposes and a very large quantity of switchgear, of every variety, for Industrial and Mining services.

In addition to being the originators of the "truck type" and many other forms which are in universal use to-day, this Company has always maintained a very high reputation for reliable switchgear.



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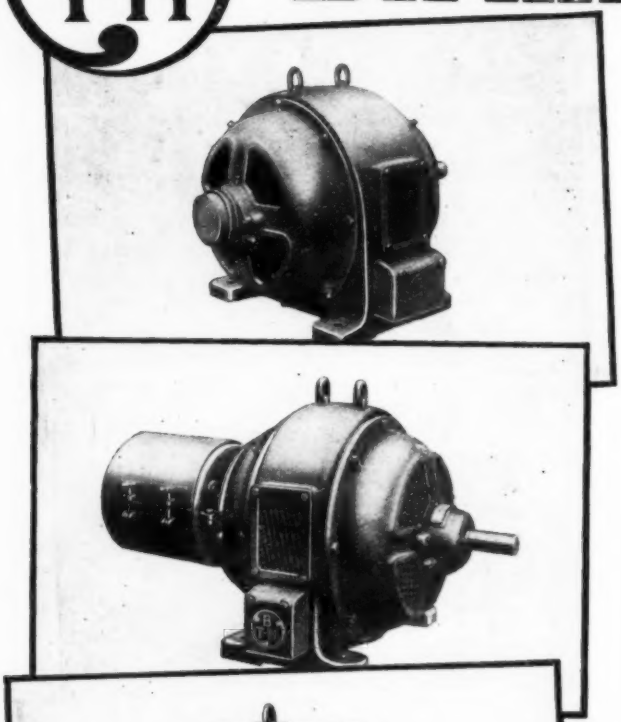
B T-H

Birmingham Works



for **Electric Motors & "Fabroil" Gears.**

The B.T.H. Birmingham Works, at Blackheath, which are illustrated below, are devoted to the production of electric motors of all types.

These works have been designed for the most up-to-date methods of mass production and the alternating and direct current motors manufactured include all sizes smaller than the heavy machines constructed in the Rugby Works.

In addition to motors for every Industrial and Mining service, these works also manufacture the well-known "Fabroil" Silent Gears.

The British Thomson-Houston Co., Ltd.

ELECTRICAL ENGINEERS AND MANUFACTURERS

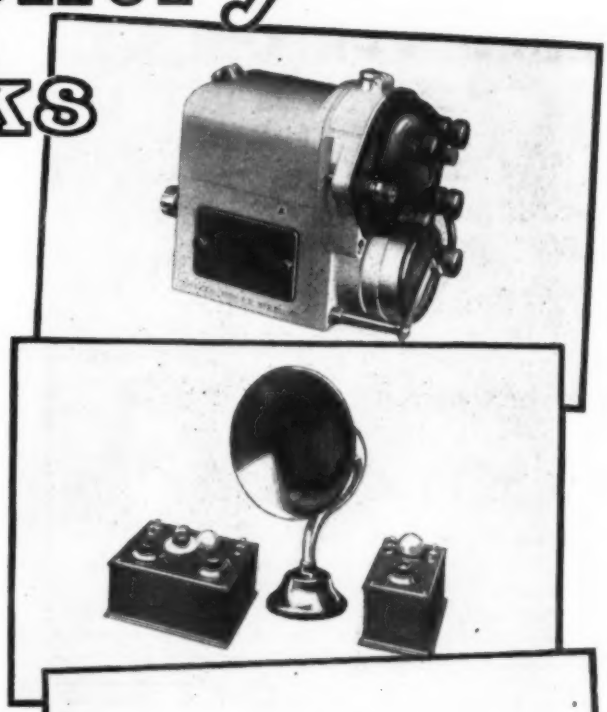
Head Office: Rugby, England. London Office: "Crown House," Aldwych.

Works: Rugby, Birmingham, Willesden, Coventry and Chesterfield.

B T-H

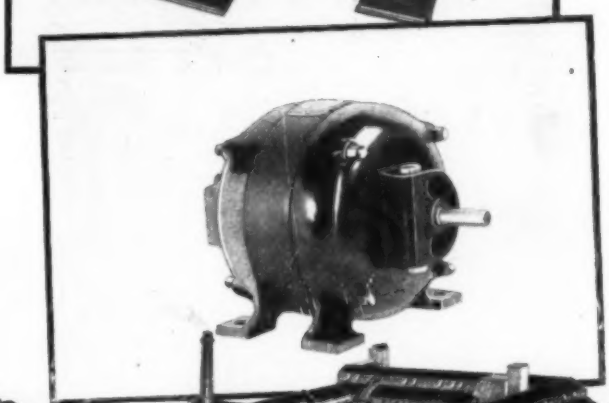
Coventry Works

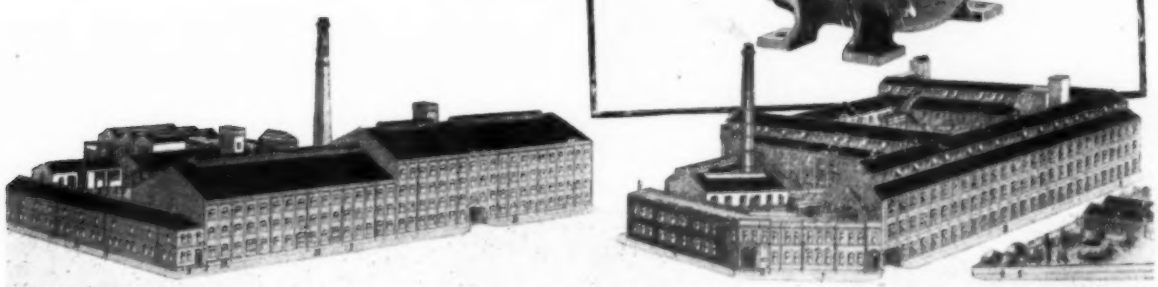
for **Radio Apparatus, Magnetos and Small Electric Motors.**



The B.T.H. Coventry Works, consisting of two adjacent factories, are devoted to the manufacture of Radio Apparatus of every description, Magnetos for motor vehicles and aircraft, and Fractional Horse-power Motors for industrial and domestic use.

The modern methods of production and the good workmanship which prevail in these works are such, that B.T.H. magnetos, for example, have assisted in attaining practically every British aerial record and many other notable uchievements abroad.





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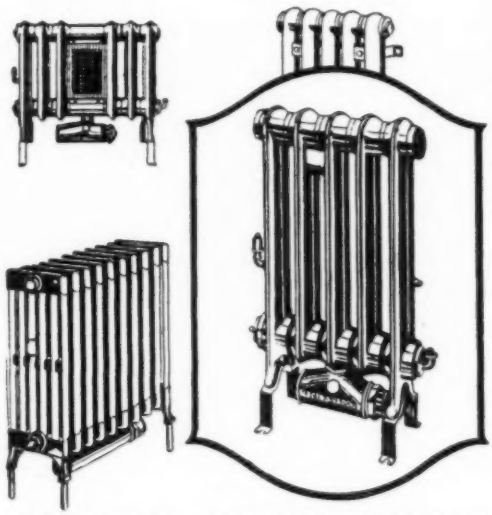
PATENT.



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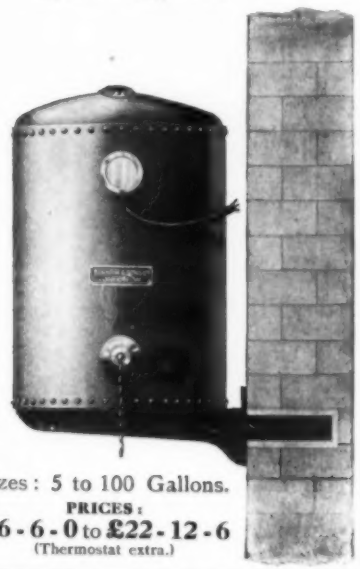

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PRICES:
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Our next Announcement—No. 2—will deal with the high-class Escapement fitted to Newbridge Time-Switch movements.

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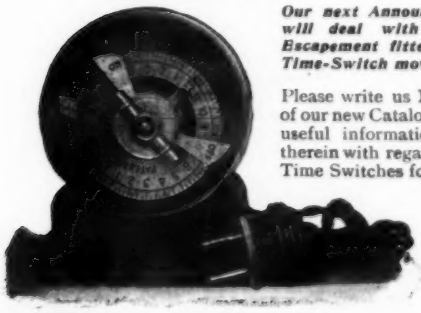

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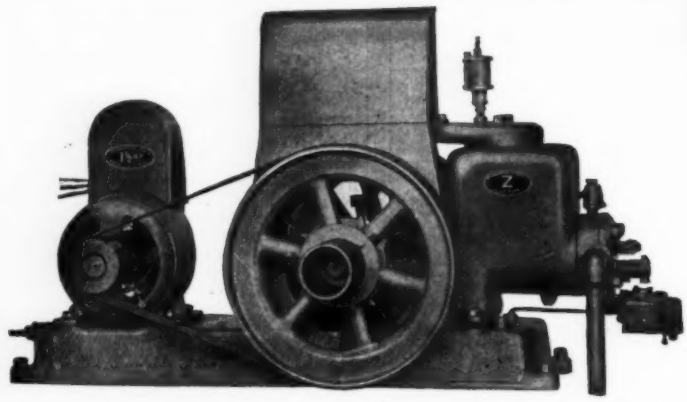

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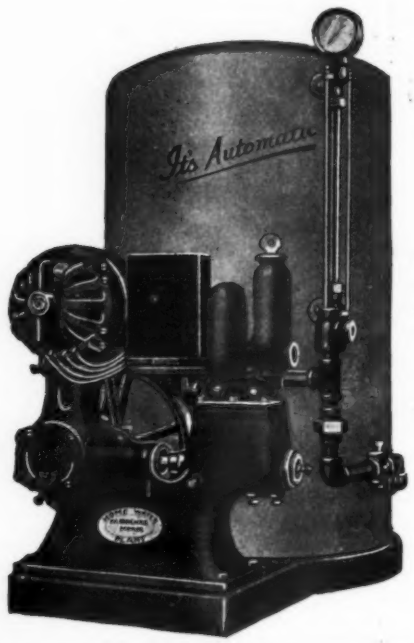

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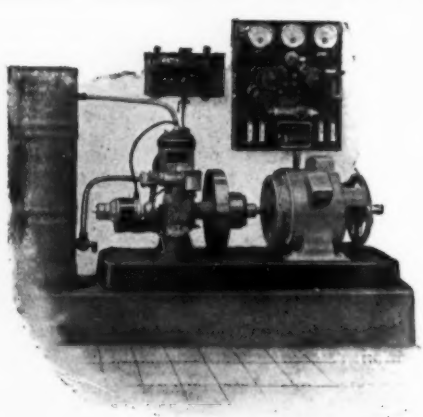

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120 Watt, ½ kW, 1½ kW, 3 kW and Pumps.

We shall be very pleased to show you and your customers our plants in full operation. If you can't come, ask for List 24 R.

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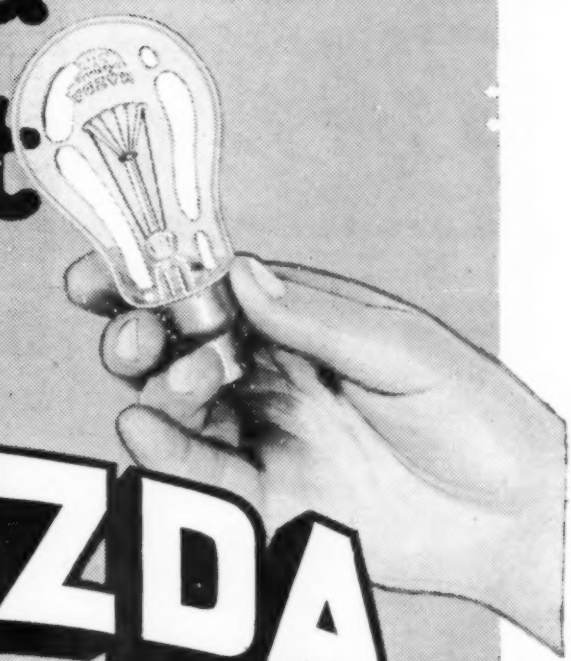
Good light and MAZDA Lamps are inseparable



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They can be bought wherever electric lamps are sold.

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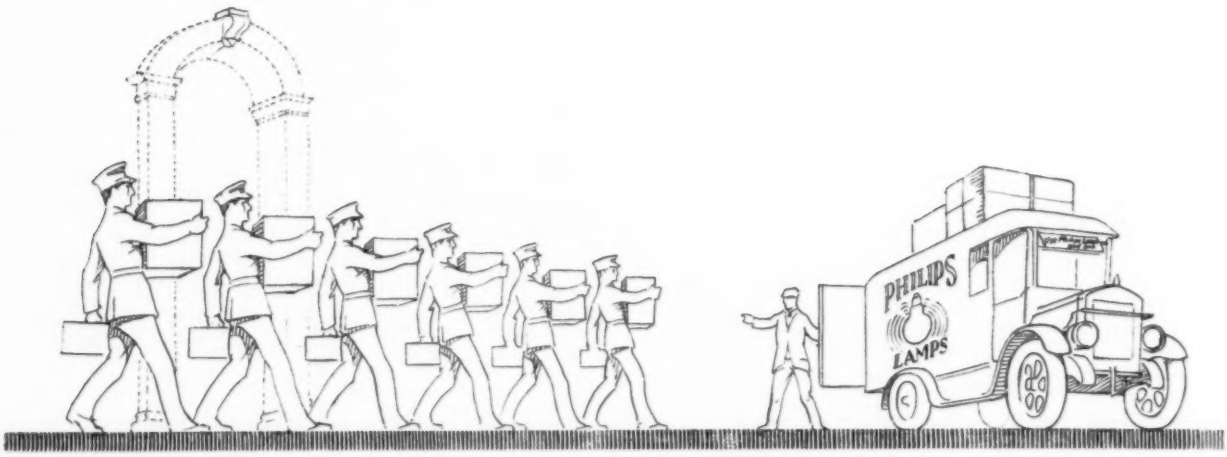

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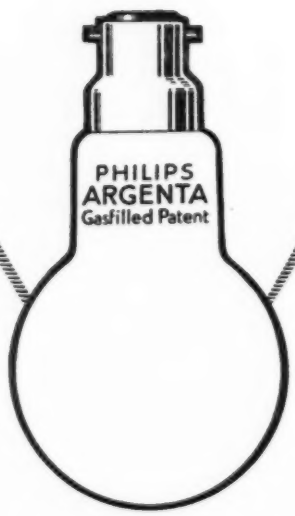

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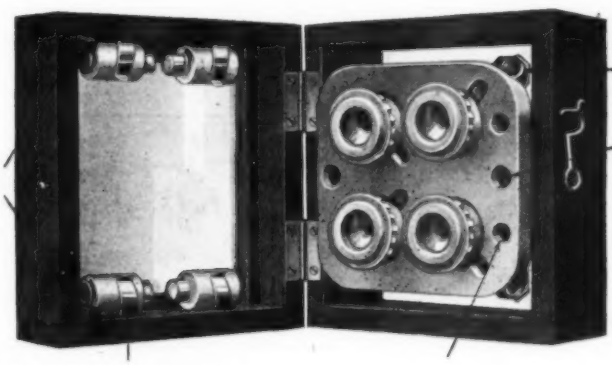
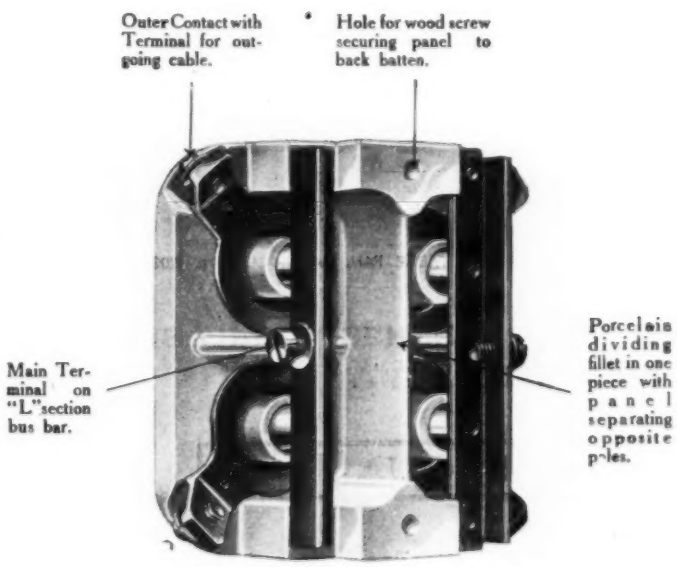

Register pegs to relieve hinges of weight on lid when closed.
Protected terminal for outgoing cable.
Wood screws for securing panel to batten of box.
Phosphor Bronze Spare Cartridge Clip. Two provided for each way.
Note bus bars are entirely enclosed.


Outer Contact with Terminal for outgoing cable.
Hole for wood screw securing panel to back batten.
Main Terminal on "L" section bus bar.
Porcelain dividing fillet in one piece with panel separating opposite poles.

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IMPROVED "ZED" SAFETY FUSES
(INCREASED RANGE).

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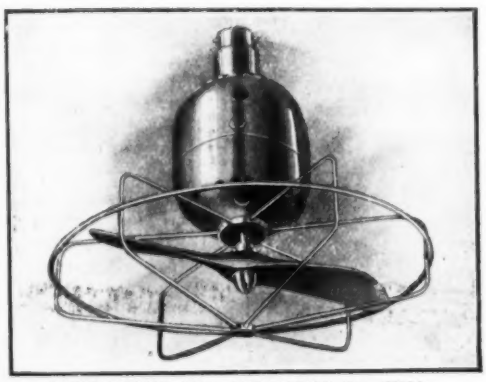

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FINISHES, POLISHED NICKEL AND DULL BLACK, ALSO DE LUXE MODEL IN GOLD LACQUER DESIGNS.

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ALL TYPES OF FANS ARE WOUND FOR TWO VOLTAGE RANGES VIZ: 100/125 V. AND 200 250 V., AND ARE SUITABLE FOR USE ON BOTH A.C. AND D.C. CIRCUITS.

FAN MOTORS ARE DESIGNED FOR CONTINUOUS RUNNING AND ARE GUARANTEED NOT TO OVERHEAT.

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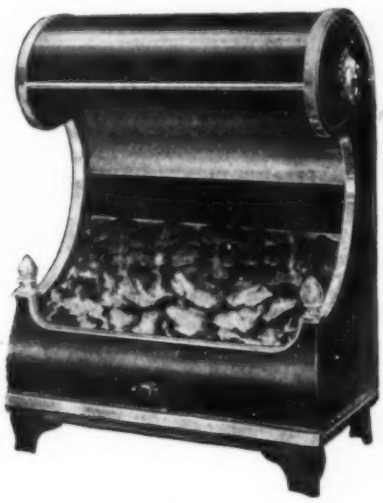
Reg. design.

FIREBLAZE. (3 kW.) Artistic appearance: effective bold front.



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The Magicoal Fire is the original fire with the flickering enchantment indistinguishable from a living coal fire.

The coals are not just pieces of coloured glass but are manufactured from specially prepared materials to represent coal in its various stages of combustion; and when out they have the appearance of an unkindled fire.

Scientific construction has been made compatible with artistic design.

No dirt and ashes are made, whilst labour is reduced to the touch of a switch.

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We are endeavouring to make them in every way helpful, and in the series we intend to cover as exhaustively as space permits every phase of Switchgear manufacture, selection and maintenance.

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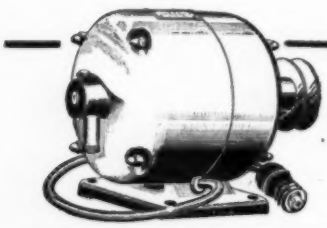
The high efficiency of Wagner Induction Motors makes them particularly suitable for any purpose where silent running is essential. Their sound construction throughout will appeal to the critical engineer. Wagner products, which include Single-phase Motors (repulsion-induction and split-phase), Fractional H.P. Motors (for d.c. and a.c.) and Fan Motors, have nearly 30 years' unrivalled reputation. Write for particulars. Delivery from London stock.



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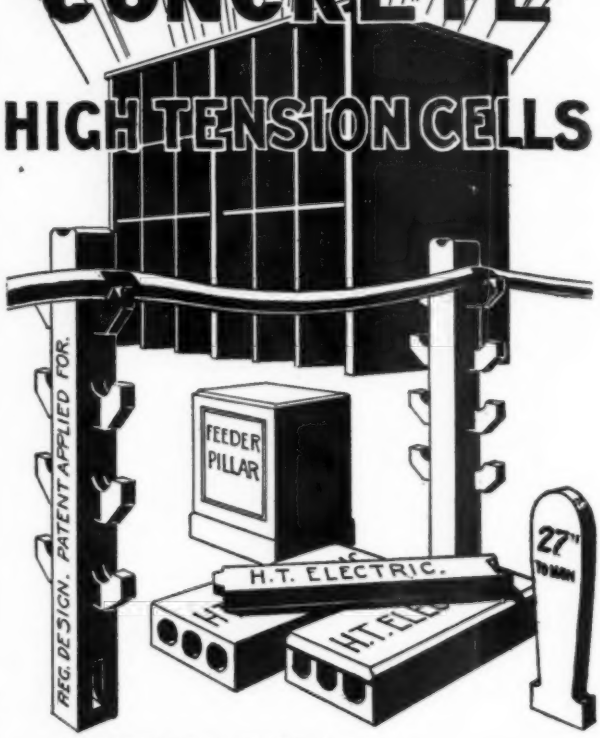
ELECTRICAL CONCRETE

HIGH TENSION CELLS

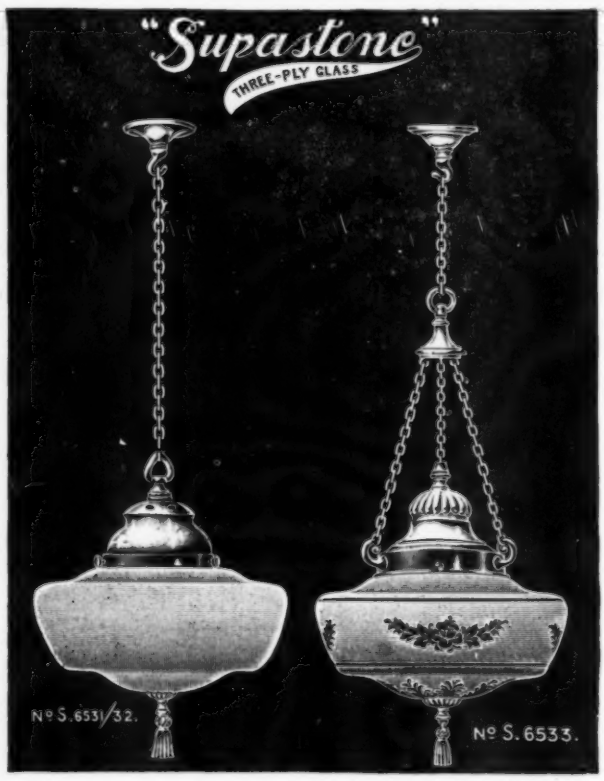


WE INVITE YOUR ENQUIRIES

CONCRETE UTILITIES, LTD.,

Directors: C.R.Belling, M.I.E.E.
C.A.Marques, A.M.I.Struct.E.

Great Amwell, Ware, Herts.
Telephone No.—WARE 84.
Telegraphic Address—"MARBEL, WARE."



SELL "Supastone" THREE-PLY GLASS IT PAYS.

TO sell "Supastone" Lighting Glassware is to deal in the finest value obtainable.

Well made from three-ply glass, the very best of its kind.

Highest Finish and very Ornamental.

SEND for
NEW ELECTRIC LIST, No. S 146,
PRINTED IN ART COLOURS.

New Designs suitable for every up-to-date lighting purpose at Moderate Prices.

NONE GENUINE UNLESS STAMPED ***"Supastone."***

STOCKED BY ALL LEADING FACTORS.

The WHOLESALE FITTINGS CO., Ltd.,

23/27, COMMERCIAL STREET, LONDON, E.1.

MANCHESTER: 78/80, High Street. BRISTOL: 14, North Street, Stokes Croft.

Something Entirely New in Electric Boiling Plates

The "Cosmos" Enclosed Boiling Plate viewed from the underside.

After years of investigation and research, Metro-Vick Supplies, Ltd, take pleasure in introducing an Electric Boiling Plate, which successfully avoids the limitations of all previous designs.

The

"COSMOS"

ENCLOSED TYPE ELECTRIC BOILING PLATE

(Fully Patented)

is manufactured under an entirely new and interesting process, resulting in a totally enclosed plate which is practically indestructible, thoroughly efficient and remarkably quick in operation.

The following figures obtained during tests by the National Physical Laboratory speak for themselves:—

2	pints of water	boiled in	8¼	minutes	consuming	285	watt hours
3	"	"	10¾	"	"	360	"
4	"	"	13	"	"	435	"
5	"	"	15	"	"	505	"

Utensils used were aluminium with machined bottoms. These figures should be compared with those for other makes and with the average GAS RING.

"Cosmos" Enclosed Boiling Plates practically cut out maintenance charges and give more satisfaction to users.

For further details send for a copy of List 150/12 (Sup. 1)

"Cosmos" Enclosed Boiling Plates are now fitted to "Cosmos" Cookers.

METRO-VICK SUPPLIES, LTD.

(Proprietors: Metropolitan-Vickers Elec. Co., Ltd.)

Metro-Vick House, 145, Charing Cross Road, LONDON, W.C.2

	Dimensions.	Loading in Watts.	Volts.	Price Each.
SIZES and PRICES.	6½ inch diameter	1,200	100/250	£2 2 0
	8½ inch diameter	2,000	100/250	£3 3 0

"Cosmos" Enclosed Type Boiling Plates are Guaranteed for Two Years.

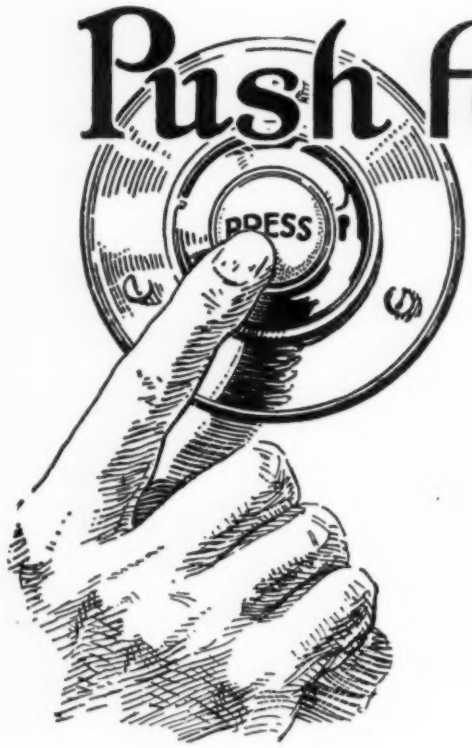
Visit the Royal Air Force Display at Hendon, July 3rd, 1926.

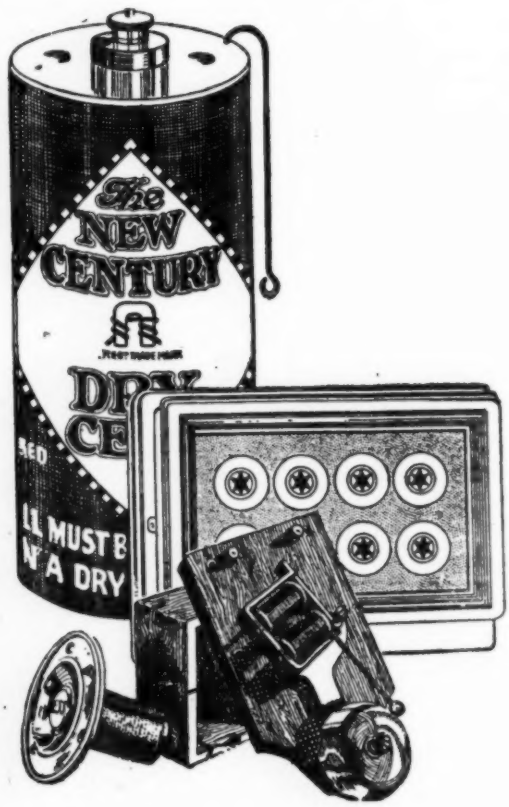
S/P04

Push for Business

in

G.E.C. Electric Bells, Cells and Accessories





Do not neglect this field. There are many houses in your neighbourhood not yet fitted with Electric Bells.

All these invite your "push" for business. Why not go after it? It is profitable business, and every installation is a lead to regular sales.

Get G.E.C. quality behind each installation and you will satisfy your customers.

G.E.C. quality is jealously guarded, and only exceptional manufacturing facilities permit of the competitive prices now ruling.

Prompt deliveries can be obtained from all G.E.C. branches.

The G.E.C. - your guarantee

THE GENERAL ELECTRIC CO., LTD.,

Head Office:

MAGNET HOUSE, KINGSWAY, LONDON, W.C.2.

Branches throughout Great Britain and in all the principal markets of the world.

FOREIGN AGENTS for the "ELECTRICAL REVIEW."

AUCKLAND, N.Z: Gordon & Gotch, Albert Street; Tait Book Co., P.O. Box 992; R. Hill & Son, Matlock House, 33/34, Quay Street; Trade Publications Co., 909, N.Z. Insurance Buildings, Queen Street.

BERLIN: Hubert Hermanns, Friedrichstr. 218, S.W.48; "Kniga" Kurfurstenstr. 70, W.62; Uberseeverlagsanstalt. G.m.b.H. Leipziger Strasse 101/102, W.8.

BOSTON, MASS., U.S.A.: F. W. Faxon Co., 83, Francis Street, Back Bay; Herman Goldberger, 110, High Street; W. H. Guild & Co., 140, Tremont Street.

BRISBANE: Gordon & Gotch, Queen Street.

CHRISTCHURCH, N.Z.: Gordon and Gotch, Manchester Street.

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HELSINGFORS (Finland): Akademiska Bokhandeln.

GOETTINGEN (Germany): A. B. Pillai & Co.

JOHANNESBURG, CAPETOWN, BLOEMFONTEIN, DURBAN, PORT ELIZABETH, &c.: Central News Agency, Ltd.

LAUNCESTON: Gordon & Gotch, Cimitiere Street.

MADRID: Editorial "Voluntad" S.A. Serrano 48.

MELBOURNE: Tait Book Co., 39, Queen Street; Gordon & Gotch, Queen Street; "Australasian Electrical Times," 312 Flinders Street; Commonwealth Magazine Agency, 294, Little Collins Street; G. Jervis Manton, 430, Little Collins Street.

MILAN: Fratelli Treves.

NANCY: Librarie Berger Levrault, 18, Rue des Glacis.

NAPLES: Libreria Fratelli Treves, Via Roma, 258.

NEW YORK: D. Van Nostrand, 8, Warren Street; Crowley, The Magazine Man, Inc., 511, E.164th Street.

PARIS: Boyveau & Chevillet, 22, Rue de la Banque; E. Le Francois, 91, Boulevard St. Germain.

PERTH, W.A.: Gordon & Gotch, William Street.

PRAGUE (Czechoslovakia): Fr. Rivnac, Librarie, Na Prikope 21; F. Topic.

ROME: Ditta P. Maglione & C. Strini, 88, Via Due Macelli.

SYDNEY: Tait Book Co., 273, George Street; Gordon & Gotch, Pitt St.; Commonwealth Magazine Agency, 183, Pitt Street; H. A. Goddard, 255a, George Street.

STOCKHOLM: Allmanna Tidningskontoret, Gustav Adolfs Torg.

TOKYO: Maruzen Co., Ltd., 11-16, Nihonbashi-Tori-Sanchome.

TORONTO, ONT.: Wm. Dawson and Sons, Ltd., Manning Chambers; Gordon & Gotch, 132, Bay Street.

WELLINGTON, N.Z.: Gordon & Gotch, Cuba Street.

ZURICH: E. Rascher & Cie Rathausquai 20.

ILLUSTRATIONS!

BLOCKS intended for use in the advertisement pages of the "Electrical Review" should not exceed 120 screen.

ELECTRICAL

PARTNERS and PARTNERSHIPS

can be obtained through

WHEATLEY KIRK, PRICE & CO.

(Established 1850).

46, Watling Street, London, E.C. 4.

16, Albert Square, Manchester. **26, Collingwood Street, Newcastle-on-Tyne.**

TO WIRELESS AND ELECTRICAL GOODS MERCHANTS, CONTRACTORS, &c.

IMPORTANT TWO DAYS' SALE BY AUCTION, WITHOUT RESERVE.

TUESDAY, JUNE 29th, and following day, at 11-30, at

550-556, OXFORD STREET, MARBLE ARCH, W., Adjoining Marble Arch Station, by

HENRY J. SHAW,

in conjunction with Messrs. Seymour, Seymour & Co.

First day's sale includes 560 CRYSTAL SETS, 2, 3, 4, 6 and 7-VALVE SETS by first-class makers, 5,000 Headphones, 275 various new Loud Speakers, 53 cwt. Sheet Ebonite, 7,000 various Accumulators, 6,000 Chokes, 1, 1½ and 2-kW Transformers, Test Sets, 5,000 Plugs and Jacks, Condensers, Wavemeters, Loose Couplers, Inductances, Earcaps, Tuners, Amplifiers, Crystals, Detectors, Coils, Volt and Ampmeters, Rheostats, Buzzers, 40,000 Microphone Buttons, 30,000 Fuses, Telephone Exchanges, 1,000 Double Telephone Cords, 60 dez. Buzzers, 5,000 Gross Wireless Bolts, Nuts, Screws, &c. 100 Coils Workshop Flex, 60 Coils Admiralty Mottled Flex, 60 Electric Hand Drillers, 120 doz. Ceiling Roses, 60 doz. Wall Plugs, 30 gross C.G.S.C. Lamp Holders, 140 gross Batten Lamp Holders, 120 doz. Adaptors, 100 doz. Pear Switches, 100 2- to 6-way Distribution Boards, 25 2- to 12-way Ironclad ditto, 40 Coils 1/20 Twin Lead-covered Cable, various Cable, Lamps, Pendants, 50,000 ft. ½-in. Screwed Conduit Tubing, &c.

Second day's sale will include a large quantity of X-RAY APPARATUS, CHEMICAL APPARATUS, &c., and the Complete Plant of a Wireless and Gramophone Cabinet Maker, Stores, &c. Also a 1925 Riley de Luxe all-weather Motor Car.

On view day previous and mornings of sale.

Catalogues from Messrs. Seymour, Seymour & Co., as above, and H. J. Shaw, 85, Newington Causeway, S.E.1. 'Phone: Hop 3862. 508

SITUATIONS VACANT.

Latest time for receiving, 5 p.m. Tuesday.

If letters are not to be delivered to certain firms or individuals (if known), instructions to that effect should be sent to the Manager of the ELECTRICAL REVIEW, who will do his best to carry out such instructions. Letters of applicants cannot in such cases be returned to them, nor can the names of Advertisers using a number in any way be disclosed.

Original Testimonials should never be sent.

GENERAL MANAGER AND ENGINEER.

THE Rhondda Tramways Company, Ltd., requires the services of a General Manager and Engineer at the commencing salary of £1,200 per annum.

The Company operates a system of tramways in the Rhondda Valley, South Wales, 21 route miles in length, current being obtained from its own generating station. It also has a fleet of 40 motorbuses operating services mainly outside of the Rhondda Valley.

Application in writing, giving full particulars of qualifications and experience, together with copies of not more than three recent testimonials, should be addressed to the Managing Director of the Company, 62-63, Queen Street, London, E.C.4, and must be received not later than the 5th July, 1926. 464

ELECTRICAL TRADES UNION.

Hackney Borough Council.

THE Hackney Borough Council has been declared "Black." Before any member of the Electrical Trades Union can accept any employment, either directly or indirectly, for this Council he must first obtain permission from the London District Committee of the Electrical Trades Union.

W. J. WEBB,
3121 London District Secretary.

Cheap prepaid Advertisements are inserted under this heading at the rate of One Penny Per Word (minimum 1s.). Three Consecutive Insertions for the price of two, if ordered and prepaid with first insertion.
Box Number and ELECTRICAL REVIEW address count as seven words.

AN Overhead Line Working Foreman wanted. Must be accustomed to tramway work and able to handle motor derrick.—Apply, giving age and experience, to 482, Electrical Review, 4, Ludgate Hill, London.

ARMATURE Winder required by old-established firm of Engineers, to take charge as Foreman of a small department.—Address by letter only, with full particulars of experience, age and wages required, to W. G. Walker & Co., Emery Hill Street, Westminster, S.W.1. 494

ASSISTANT required for Sales Department of Electric Motor Manufacturers, age about 23; progressive position. State salary required; personal application preferred.—Higgs, Witton, Birmingham. 486

CANVASSER required temporarily to canvass for Supply Company in Lincolnshire carrying out wiring on deferred payments. Applicants should state salary required or if salary and commission terms are preferred. Knowledge of electrical installation work is desirable.—517, Electrical Review, 4, Ludgate Hill, London.

DRAUGHTSMAN, Junior, required in Midlands, experienced in automatic control gear and wiring diagrams.—State full experience, age and salary required, to 493, Electrical Review, 4, Ludgate Hill, London.

DRAUGHTSMAN required, experienced in electric light and power plans for ships. Must have knowledge of switchgear necessary for same.—State age, experience and salary required, to 500, Electrical Review, 4, Ludgate Hill, London.

DRAUGHTSMAN wanted with experience in mechanical design of d.c. and a.c. dynamos and motors.—Give full particulars of experience, age, and salary required, to 506, Electrical Review, 4, Ludgate Hill, London.

EXPERIENCED Designer wanted to take charge, under the supervision of the Chief Switchgear Designer, of a section engaged on the development of switch and control gear of all descriptions. Only those having an intimate knowledge of present-day practice need apply.—Apply, stating experience and salary expected, to English Electric Co., Stafford. 491

EXPERIENCED Transformer Draughtsman wanted.—Apply, giving full particulars of experience and state age and salary required, to English Electric Co., Stafford. 483

ILLUMINATING Engineer required, capable of designing scientific reflectors and fittings for street, industrial and shop lighting, and fully conversant with their modern application.—Apply, stating age, experience and salary required, to 502, Electrical Review, 4, Ludgate Hill, London.

JUNIOR Assistant Electrical Engineer required, for the introduction and general maintenance of Engineering Equipment of a large firm in London. Must have had a good technical education, some practical experience and must be a fair draughtsman.—Full particulars to 487, Electrical Review, 4, Ludgate Hill, London.

SITUATIONS VACANT.—*Continued.*

LEADING Manufacturers of tumbler switches, general lighting accessories, ironclad gear, and switchgear, propose appointing Two or Three Gentlemen as District Superintendents. Necessary qualifications include good appearance and address, and intimate knowledge of a particular area, thorough knowledge of the business, the necessary experience and ability to supervise a reasonably large area of ground and the efforts of two or three travellers.—Applicants will please give details of their technical and commercial experience, age and the particular area in which their connection lies, together with approximate salary required, all of which will be treated in confidence, to Box No. P659, c/o 19-21, Corporation Street, Birmingham. 5274

MAINS Foreman and Plumber-Jointer required by Municipal Electricity Supply Undertaking. Wages £4 per week. A house will be found for the successful applicant, if required. —Apply, stating experience and enclosing copies of recent testimonials, to 509, Electrical Review, 4, Ludgate Hill, London.

REPRESENTATIVES required with good connections in the Electrical and Furnishing trades, to push sales of good class oak and mahogany floor and table Standards, Candlesticks, &c., in the Home Counties, South Coast and Lancashire. Commission basis only, but excellent immediate prospects to the right men.—Apply, stating (in confidence) age, ground covered, firms at present represented and approximate turnover, to F. Witton, 308, Summer Lane, Birmingham. 489

REPRESENTATIVES required for the Sale of insulating materials such as Fibre, Leatheroid, Cloth, Silk Paper, Adhesive Tapes, Ebonite, Mica, &c. Only those having good connections and can influence real business need apply.—Reply in confidence, stating districts covered, and full particulars of experience, &c., to 390, Electrical Review, 4, Ludgate Hill, London.

REQUIRED immediately, for service abroad, young Engineers, good electrical training, experience country house plant installation; good knowledge accumulators necessary. Excellent prospects.—418, Electrical Review, 4, Ludgate Hill, London.

REQUIRED, the services of an Electrical Engineer experienced in stage and cinema equipment. Must be able to supervise and maintain existing plant over a large area and also deal with the commercial side.—State age, experience and salary required, to 5268, Electrical Review, 4, Ludgate Hill, London.

SALES Engineer, young, required by Electrical Engineers to take charge of small sales department. Give full particulars, experience and salary.—5279, Electrical Review, 4, Ludgate Hill, London.

SALES Organiser for home and export trade and publicity. Personal experience of Dominions and foreign markets preferred. Able to undertake travel abroad.—Address full details, experience, references, salary, in writing only, to General Manager, Joseph Rodgers & Sons, Limited, 6, Norfolk Street, Sheffield. 498

SALESMEN. Part-time Salesmen required for guaranteed branded and advertised electric lamps already largely used. To anyone having an existing connection among the electrical trade, this offers a good opportunity to considerably augment his income. Good commission with substantial office support in securing business.—520, Electrical Review, 4, Ludgate Hill, London.

SALESMEN required for London and district by well-known Continental firm of Lamp Manufacturers, to sell all types of electric lamps under E.L.M.A. conditions. Only those with established connection need apply.—Write in first instance, stating age, experience and salary required, indicating in what part of London actual connection exists, to 473, Electrical Review, 4, Ludgate Hill, London.

SHORTHAND Typist required in West End electrical engineers' office, not under 25; first-class experience electrical trade; must be able to work on own initiative.—Apply, stating full particulars, to 503, Electrical Review, 4, Ludgate Hill, London.

THE United River Plate Telephone Company, Limited, require for Buenos Aires a Telephone Engineer with experience in design of aerial and cable trunk lines and routes; also knowledge of circuits, repeating equipment, transmission, &c. Age about 30-35; commencing salary offered about £800 per annum (English living equivalent say £600 per annum for single man); five years' contract; 1st class passage.—Apply by letter, stating full particulars, to 5, London Wall Buildings, Finsbury Circus, London, E.C. 532

TRAVELLER required with connection in London amongst electrical and mechanical engineers and contractors, a useful workshop device on a liberal commission basis.—For particulars, apply in confidence to 5277, Electrical Review, 4, Ludgate Hill, London.

TRAVELLER wanted for London by manufacturers of Domestic Electric Appliances. Wholesale only. Salary and commission to man who can get business.—Particulars and experience to 481, Electrical Review, 4, Ludgate Hill, London.

SITUATIONS VACANT.—*Continued.*

TROPICS. Electrical Engineer wanted to take charge of the erection and maintenance of a small a.c. Power Station and Plant. Must have had experience of small power station work and simple overhead line transmission. Useless to apply without these qualifications. There are excellent prospects for a qualified man who can adapt himself to local conditions. Three-year contract, commencing salary £250 with free quarters, servants and passages. Cost of living is low. To sail end of August.—Write Box A.G., c/o Davies & Co., 95, Bishopsgate, E.C.2. 5305

TWO good and experienced Travellers wanted for the sale and rental of Telephone Installations, inter-communication and automatic.—505, Electrical Review, 4, Ludgate Hill, London.

WIRELESS.—Five to ten pounds per week for industrious reliable men seeking permanent employment; applicants must have practical knowledge of installation of set and aerial, be a householder or live with parents, and be able to give references.—State age and experience to 12, Electrical Review, 4, Ludgate Hill, London.

APPOINTMENTS FILLED.

Dissatisfaction having been so often expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled may we suggest that advertisers notify us to that effect when they have arrived at a decision. We will then insert a notice free of charge under this heading.

BOX 55 (Junior Engineer); Box 366 (Youth for Drawing Office); Box 5186 (First-class Wireman).

SITUATIONS WANTED.

Cheap prepaid Advertisements are inserted under this heading at the rate of One Penny Per Word (minimum 1s.). Three Consecutive Insertions for the price of two, if ordered and prepaid with first insertion.
Box Number and ELECTRICAL REVIEW address count as seven words.

A CAPABLE Electrician desires position of charge, having held similar position on works maintenance; 21 years' experience in all branches of trade.—5203, Electrical Review, 4, Ludgate Hill, London.

A COMPETENT Electrician (29) requires change; quick and reliable all classes of wiring, construction, or maintenance of plant or mains.—5184, Electrical Review, 4, Ludgate Hill, London.

A SKILLED Electrician; installation and maintenance; all systems and plants.—33, Laburnum Road, Wimbledon, S.W.19. 5269

A YOUNG Electrical Engineer, 3 years' articleship central station, all departments, 18 months' a.c. test B.T.H. Co., seeks progressive situation.—"The Glen," Kingswinford, Staffs. 5305

A YOUNG Electrician (25), capable and willing, desires a responsible position where there is scope and initiative required; knowledge of electrical work is both technical and practical. At present in charge of an electrical department.—5219, Electrical Review, 4, Ludgate Hill, London.

ACTIVE Young Electrical Engineer (22), desires opening, technical or commercial; sound theoretical and practical training; good diploma, public school.—5175, Electrical Review, 4, Ludgate Hill, London.

ACCUMULATOR Mechanic seeks berth; 18 years' experience in making and repairing all types.—E.H., 150, Kingsland Road, E.2. 5214

ADVERTISER, A.M.I.E.E., with wide experience, good Salesman and Buyer, seeks representation, London and district; specialist in switchgear; in touch with buyers.—5208, Electrical Review, 4, Ludgate Hill, London.

ADVERTISER (age 27), seeks change, preferably as Traveller. At present in wireless trade Good knowledge of electrical accessories; keen salesman and traveller.—136, Elthorne Road, Upper Holloway, N.19. 5148

ADVERTISER, Charge Hand or position of trust; installations, motors, electric cookers, vehicles.—"Electrician," 6, Listria Park, N.16. 5181

ADVERTISER desires a position where twenty years' experience as an installation engineer, following seven years' practical and technical training, would be considered worth £250-£300 a year.—5284, Electrical Review, 4, Ludgate Hill, London.

ADVERTISER seeks a trustworthy position in a progressive undertaking. Over 14 years' power house experience, with high speed steam and oil engines, switching operations and regulation of dynamos, single and 3-phase alternators, battery charging, meter reading, installation testing and inspecting, &c.—5304, Electrical Review, 4, Ludgate Hill, London.

ADVERTISER seeks position as Representative. Lamps, accessories, fittings, &c. Area, West of England; live connection; 7½ years with well-known manufacturing concern. —5135, Electrical Review, 4, Ludgate Hill, London.

SITUATIONS WANTED.—*Continued.*

ADVERTISER (39) seeks position, any capacity; extensive experience in factory organisation and routine, including rate-fixing, inspection, progress; good controller of labour, either sex; excellent references.—5302, Electrical Review, 4, Ludgate Hill, London.

ADVERTISER, with splendid connection with electrical factors and contractors in all main towns of England, Scotland and Wales, carrying only limited number of lines, would represent wholesale house on commission basis.—5281, Electrical Review, 4, Ludgate Hill, London.

AN Electrical Engineer (26), Stud. M.I.E.E., desires responsible progressive position. 5 years indentured well-known firm. 2 years' supervision erection, sub-station and plant.—5155, Electrical Review, 4, Ludgate Hill, London.

AN Electrical Engineer seeks charge of small supply undertaking; wide experience with steam, gas, oil and hydro-electric practice; overhead and underground transmission.—5151, Electrical Review, 4, Ludgate Hill, London.

AN Electrician requires employment; any kind of work; screw, slip, or lead; references.—Radnor, 3, Oulton Street, Battersea. 5295

AN Engineer (30), accept anything temporary; low salary; Faraday Diploma; works, shift engineer, commercial experiences.—G., 22, Ravensbourne Gardens, Ealing. 5134

ARMATURE Winder, 8 years' experience; repairs, rewinds, maintenance.—G. Cobb, 11, Colistone Road, Wandsworth, S.W.18. 5273

AS General Assistant or Junior Shift Engineer. Young Man (27), keen and reliable; experienced all departments of small supply undertakings; desires post offering scope for ability and initiative. Steam, oil, mains, estimating; good draughtsman.—5286, Electrical Review, 4, Ludgate Hill, London.

AS Technical Correspondent, sound electrical and mechanical experience, accumulators, switchgear, motors, &c.—5301, Electrical Review, 4, Ludgate Hill, London.

AS Junior Draughtsman: Young Man (22), energetic, 6½ years' practical mechanical, electrical experience, thorough Secondary and Technical Schools education, desires post. Good knowledge machine drawing, mathematics; references.—Stanbury, 109, Foleshill Road, Coventry. 5212

B.SC., experienced installation work and control gear, requires post as Junior Assistant, manufacturers or contractors; references.—5278, Electrical Review, 4, Ludgate Hill, London.

COMMERCIAL Engineer desires position with established firm as Sales Engineer, Branch Manager, or other responsible position.—5145, Electrical Review, 4, Ludgate Hill, London.

COUNTER Sales or Ledger Clerk (Male); 11 years' experience with good class wholesale electrical firm.—W. Hatch, 133, The Grove, Hammersmith, W.6. 5289

DESIGNER Draughtsman, 32, electrical, mechanical; London; small machines, instruments, &c.; experience includes factory management.—5239, Electrical Review, 4, Ludgate Hill, London.

ELECTRICAL Engineer (age 22), 7½ years' experience all branches, manufacturing motors, &c., 5 years' indentures, seeks progressive situation any district.—5240, Electrical Review, 4, Ludgate Hill, London.

ELECTRICAL Engineer, age 42, works training, seeks berth; late manager electrical contractors. Sales, estimating, publicity and technical staff experience; also telephone expert; highest references as to character and ability.—5142, Electrical Review, 4, Ludgate Hill, London.

ELECTRICAL Engineer (23½), Stud. I.E.E., City Guilds final, Higher Grade National, 5 years indentured, good general practical knowledge, seeks progressive position.—5306, Electrical Review, 4, Ludgate Hill, London.

ELECTRICAL Fitter and Wireman's Mate or Improver (21) seeks situation.—Goddard, 27, Orchard Road, Highgate. 5153

ELECTRICAL Salesman seeks re-engagement; showroom and bookkeeping (London experience); preferably in S.W. or North England.—5169, Electrical Review, 4, Ludgate Hill, London.

ELECTRICAL Wireman (25), T.U.; all systems; wireless repairs, seeks situation.—R. Dowden, 14, Alpha Place North, N.W.6. 5261

ELECTRICIAN (25), 11 years' varied experience both maintenance and new installations, willing to take job in town, country, or abroad.—F.H., 27, Cresswell Place, South Kensington, S.W.10. 5293

ELECTRICIAN.—Reliable Man, piecework or day work wanted.—S., 30, Ringmer Avenue, Fulham, S.W.6. 5258

ELECTRICIAN, long experience all systems, installations, jobbing, sub-contract, builders' carcasing; reliable; anywhere.—113, Albert Street, N.W.1. 5237

SITUATIONS WANTED.—*Continued.*

ELECTRICIAN, used to plant, maintenance, wiring, engines, batteries, outside lines and house.—C., 5, Windsor Road, Holloway, N. 5264

ELECTRICIAN (young) seeks situation; familiar with screwed slip casing, lead-covered, maconite; 9 years.—F.M., 42, Strickland Street, S.E.8. 5233

ELECTRICIAN, wiring, all systems, plant and battery work, small battery repairs; excellent reference.—Wakely, 14, Roseland Terrace, Exeter. 5229

ELECTRICIAN, all-round reliable wireman, screwed tube, power and lighting, arc lamp mechanic and jointer.—B., 42, Kennedy Road, Barking, E. 5228

ELECTRICIAN, 15 years' practical experience lighting and power; all wiring systems.—A.W., 277, Shirland Road, Paddington, W.9. 5226

ELECTRICIAN (24), good wireman, all systems; experience private generating plants, fitting, dynamo repairs, &c.; good technical knowledge; Sussex or Surrey preferred.—5174, Electrical Review, 4, Ludgate Hill, London.

ELECTRICIAN or Mate, light, heat, wireless, &c.—Rees, 144, Harrow Road, Paddington. 9682

ELECTRICIAN, good all round, wiring all systems, jobbing, repairs, lighting, power, &c.; 20 years' experience.—Hall, 25, Harringay Grove, Hornsey, N 8. 5157

ELECTRICIANS.—Competent Electrical Improver, age 20, seeks situation; own tools; experience in all classes of wiring; willing to do any kind of work. Rate, 10½d. per hour.—Write, 38, Trinity Street, Shrewsbury. 5255

ELECTRICIAN'S Mate (19) requires situation. Three years' general experience. Strong and willing.—"Mate," 133, Fourth Avenue, E.12. 5173

ELECTRICIAN'S Mate wants job (good practical).—F. Summers, 13, Archibald Place, Farm Street, W.1. 5217

ENGINEER, disengaged July; experienced steam, hot water, turbine, gas, petrol, refrigerating and electricity plants; good all round engineer; 5 years' present experience with large public institutions.—5291, Electrical Review, 4, Ludgate Hill, London.

ENGINEER, 35, single, wants work, home or abroad; sea experience, power station turbines, watertube boilers, oil fuel and general repair work; good references; not afraid of work.—5271, Electrical Review, 4, Ludgate Hill, London.

ESTIMATING Engineer, heavy plant, switchgear, control year, competitive light engineering, telephone equipment from drawings; exceptional electrical and manufacturing knowledge; expert correspondent; factory experience, important companies.—5222, Electrical Review, 4, Ludgate Hill, London.

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7½-h.p. Motor, by Mather & Platt, 1,500/1,700 revs., shunt, interpole. ball bearings.
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One	30	585	,,	B.T.H.
One	40	710	,,	Westinghouse
Three	40	710	,,	Siemens
Nine	45	940	,,	Fuller
Three	50	950	,,	,,
One	50	955	,,	Newton Bros.
One	50	730	,,	Siemens
One	50	480	,,	Westinghouse
One	50	333	,,	Siemens
Four	65	720	,,	Brush
One	70	480	,,	B.E.P.
One	85	485	,,	J. P. Hall
One	100	583	,,	E.C.C.
Two	125	485	,,	Brush
One	150	366	,,	E.C.C.
Two	200	750	,,	Newton Bros.
One	330	575	,,	Westinghouse
One	440	490	,,	E.C.C.
Two	24	1435	sq. cage	Phœnix
One	26	1440	,,	B.T.H.
Four	50	964	,,	Newton
Three	60	960	,,	Newton
Three	60	725	,,	B.T.H.
Three	60	720	,,	L. D. & M.
Five	75	970	,,	Newton

DIRECT CURRENT, 110 VOLTS.

Stock.	H.P.	Speed.	Winding.	Maker.
One	3	1400	shunt	B.T.H.
One	5½	1300	compound	Holmes
One	7	630	shunt	Newtons
One	15	625	,,	L. D. & M.
Two	18	1300	compound	Phœnix
One	30	675	shunt	Laurence, Scott
One	37½	300	,,	Dick, Kerr
One	40	375/625	compound	Mawdsley
One	75	840	shunt	E.C.C.

DIRECT CURRENT, 220/230 VOLTS.

Stock.	H.P.	Speed.	Winding.	Maker.
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One	14	1260	shunt	Newtons
One	15	365	,,	Crompton
Two	20	780	,,	Laurence, Scott
Two	20	500	,,	Crompton
Three	25	460	,,	Mather & Platt
One	30	1250	,,	L. D. & M.
One	37	420	,,	E.C.C.
Two	48	270	,,	Phœnix
One	50	920	,,	Vickers
One	65	610	,,	Laurence, Scott
One	75	585	,,	Dick, Kerr
One	80	750/1250	compound	Mawdsley

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One	3	360/1080	compound	,,
One	3·4	1490	shunt	,,
One	9	380	,,	Newtons
One	12	310	,,	,,
One	13	335	,,	,,
Two	16	1650/1720	,,	B.E.P.
Two	20	420/720	compound	J. P. Hall
One	28	700	,,	Crompton
One	30	750	,,	,,
One	38	680	shunt	Vickers
Two	40	950	,,	Crompton
One	40	710/780	,,	Vickers
One	40	620	,,	Crompton
Three	50	920	,,	Mather & Platt
One	50	750	,,	Rhodes Motors
Two	52	980	,,	Mather & Platt
One	52	800	,,	Rhodes
One	65	305/610	compound	L. D. & M.
One	70	325/650	,,	,,
One	75	840	shunt	E.C.C.
Two	80	900	,,	,,
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Mather, Platt	10	440	1210	Shunt	20
Electrical Co.	130	440	440	Compound	145
Brush	150	460	375	Shunt	130
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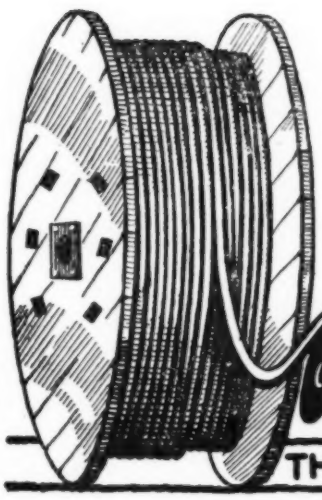

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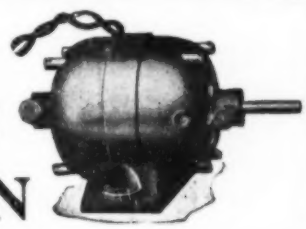

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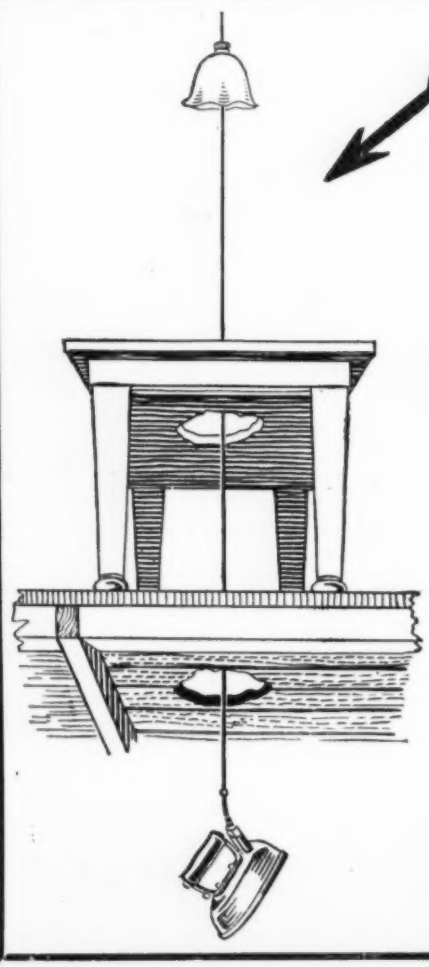

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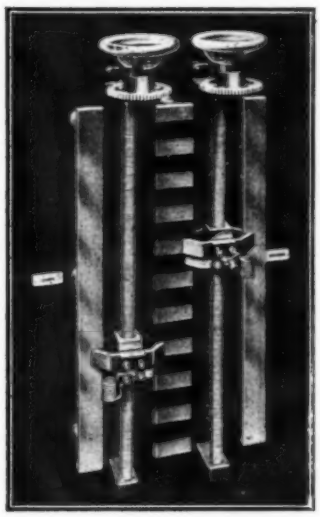

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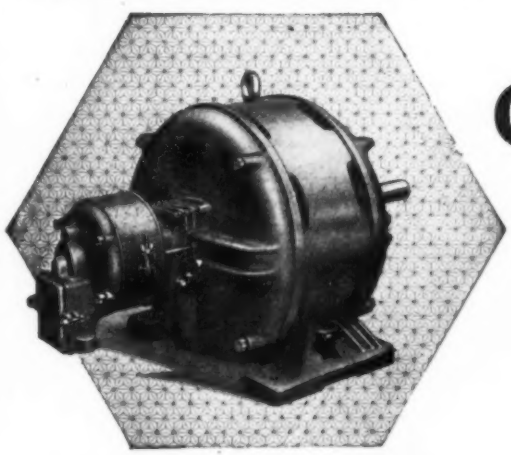

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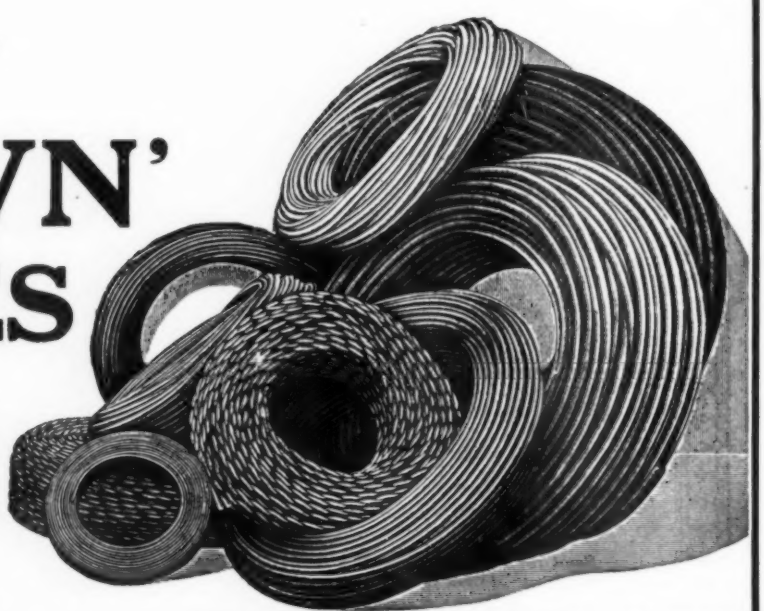

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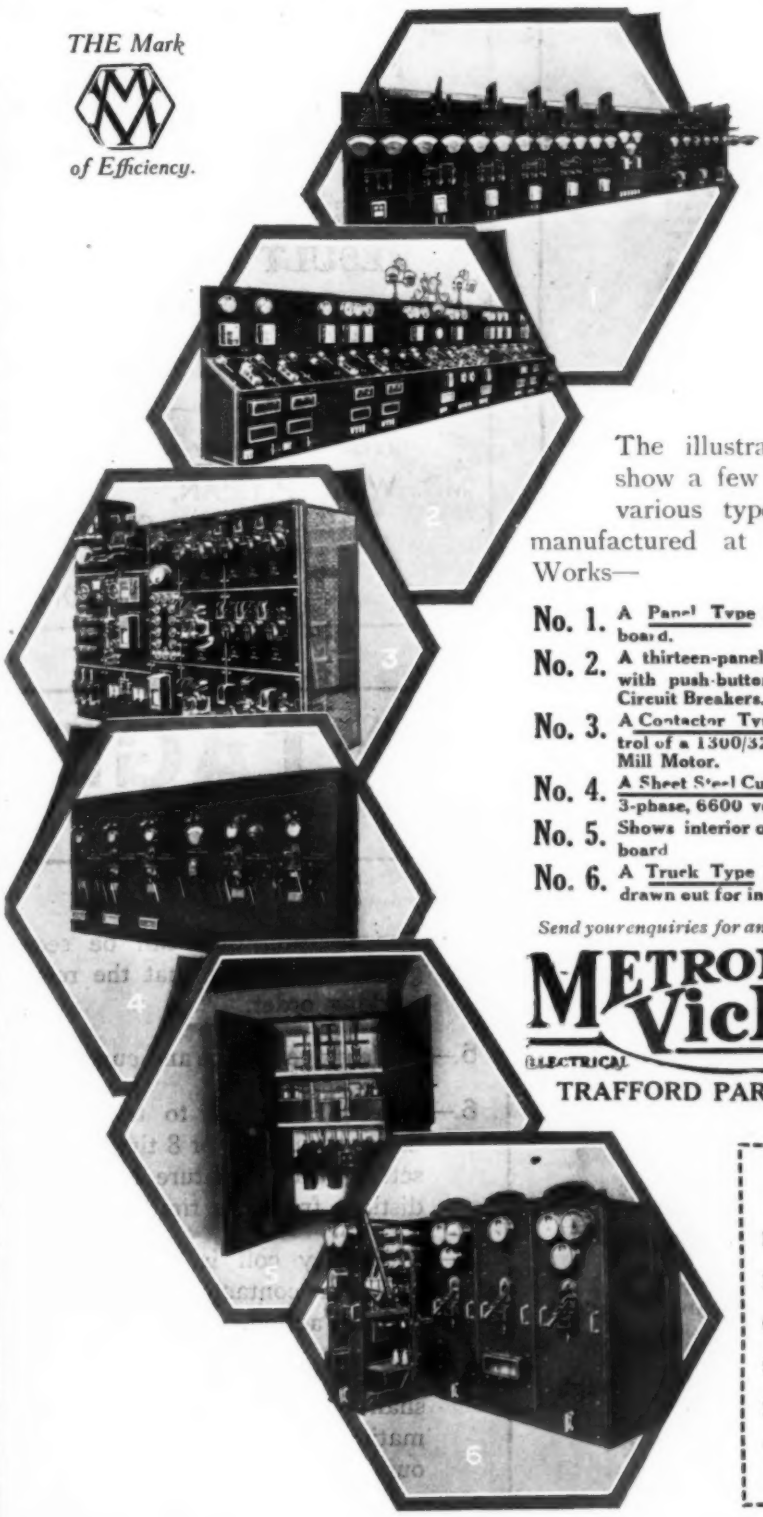

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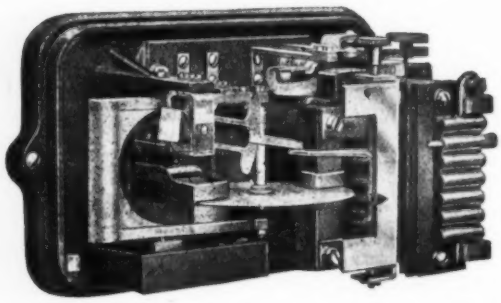

1.—Low initial cost and volt-ampere consumption.

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3.—"Floating" is impossible.

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5.—Wide range of time and current settings.

6.—Can be adjusted to trip instantly if desired with 4, 6 or 8 times the current setting. This feature is separate and distinct from the time setting.

7.—The relay coil is short circuit proof and the contacts have a quick and definite action.

8.—If you are interested write us. We shall be pleased to supply full information and arrange demonstration at our Walthamstow Works.

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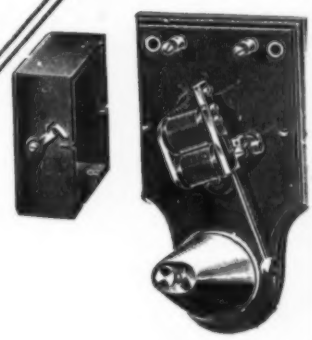

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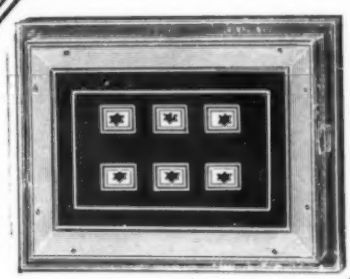
Written to your specification within two or three days from receipt of order.



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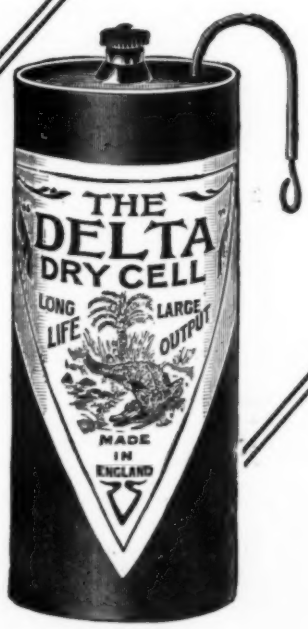

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OFFICIAL NOTICES.

Latest time for receiving, 5 p.m. Tuesday.

CITY OF NOTTINGHAM.

Electricity Undertaking.

TENDERS FOR GENERAL STORES.

THE Electricity Committee of the Corporation are prepared to receive Tenders for the supply of General Stores required in connection with the Electricity Undertaking for the period of twelve months, commencing on the 1st day of July, 1926. Particulars and forms of tender may be obtained on application to the Electricity Engineer at the Electricity Station, Talbot Street, Nottingham, on the payment of a deposit of 5s., which will be returned on receipt of a *bona-fide* tender.

The Committee will not consider any tender except on the authorised form, which must be delivered to the undersigned, in the special envelope provided for the purpose, on or before Tuesday, the 6th day of July next.

The Committee do not bind themselves to accept the lowest or any tender, and tenders will only be accepted from persons conforming to the conditions as regards paying the local standard rate of wages, and to the working rules of the Nottingham district applicable to the various trades

W. J. BOARD,
Town Clerk.

Guildhall, Nottingham. 443

COUNTY BOROUGH OF CROYDON.

Electricity Department.

ELECTRIC LOCOMOTIVE COAL HANDLING CRANE AND GRAB.

THE Council are prepared to receive tenders for an Electric Locomotive Coal Handling Crane and Grab.

Plan of site, specification and form of tender may be obtained on application from the Engineer and Manager, Electric House, 38, High Street, Croydon.

Tenders on the prescribed form to be sent to me by noon on July 5th, 1926, endorsed "Tender for Electric Locomotive Coal Handling Crane and Grab—Electricity Dept."

Tenders will only be received subject to the terms of the draft contract deposited at my office, which includes special conditions, and the I.E.E. model general conditions, and which may be inspected during office hours.

The Council will not be bound to accept the lowest or any tender.

J. M. NEWNHAM,
Town Clerk.

Town Hall, Croydon.
June 22nd, 1926. 523

COUNTY BOROUGH OF CROYDON.

Electricity Department.

ELECTRIC CRANE TRACK.

THE Council are prepared to receive tenders for an Electric Crane Track.

Plan of site, specification and form of tender may be obtained on application from the Engineer and Manager, Electric House, 38, High Street, Croydon.

Tenders on the prescribed form to be sent to me by noon on July 5th, 1926, endorsed "Tender for Electric Crane Track—Electricity Dept."

Tenders will only be received subject to the terms of the draft contract deposited at my office, which includes special conditions, and the I.E.E. model general conditions, and which may be inspected during office hours.

The Council will not be bound to accept the lowest or any tender.

J. M. NEWNHAM,
Town Clerk.

Town Hall, Croydon.
June 22nd, 1926. 522

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY.

TENDERS are invited for the supply, delivery and erection at the Birchills Power Station, Walsall, of three Steam Boilers, Pulverised Fuel Plant, Ash and Coal Handling Plant and Boiler House Auxiliaries.

Instructions for tender, the form of tender and specification can be obtained from Mr. E. M. Lacey, 12, Victoria Street, Westminster, S.W.1, on payment of a deposit of £5 5s., which will be returned on receipt of a *bona-fide* tender.

Additional copies may be obtained at £1 1s. each.

Tenders sealed and endorsed in accordance with the instruction for tender are to be delivered to the undersigned, not later than noon on Saturday, the 24th July, 1926.

The lowest or any tender will not necessarily be accepted.

S. T. ALLEN,
Chief Engineer and Manager.

83, Darlington Street, Wolverhampton. 540

OFFICIAL NOTICES.—*Continued.*

COUNTY BOROUGH OF SOUTHEND-ON-SEA.

Street Lighting.

TENDERS are required for 300 Relay Switches for Distant Control of Street Lamps. Particulars may be obtained from the undersigned.

ROBERT BIRKETT, M.I.E.E.,
Borough Electrical Engineer and General Manager.

Borough Electrical Engineer's Office,
London Road, Southend-on-Sea.
June 21st, 1926. 516

INDIA STORE DEPARTMENT.

THE Director-General, India Store Department, Branch No. 36, Belvedere Road, Lambeth, S.E.1, invites tenders for :—

Rotary Converters, 500 kW, 250 volts, with step-down transformers.

Tenders due July 16th, 1926.
Tender forms obtainable from the above. 504

NOTICES RELATING TO PATENTS.

Advertisements are inserted under this heading at 14s. per inch.

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HIGH
EFFICIENCY
WITH
LOW GRADE
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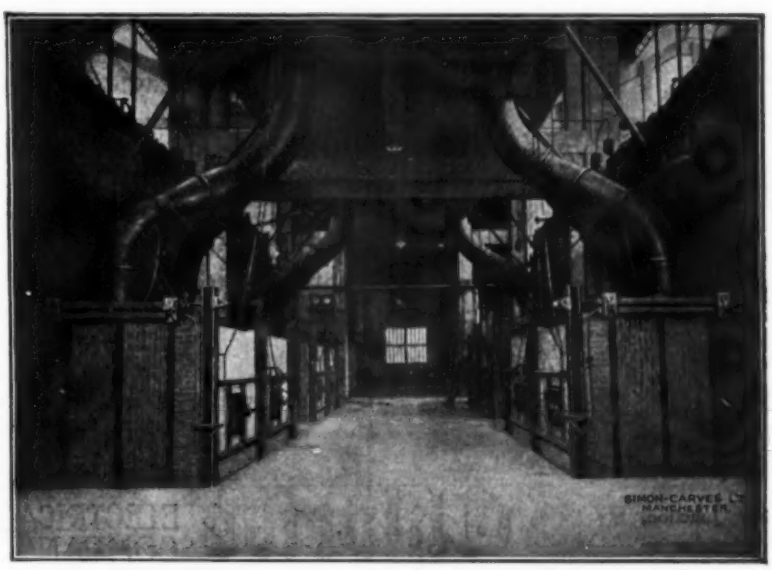

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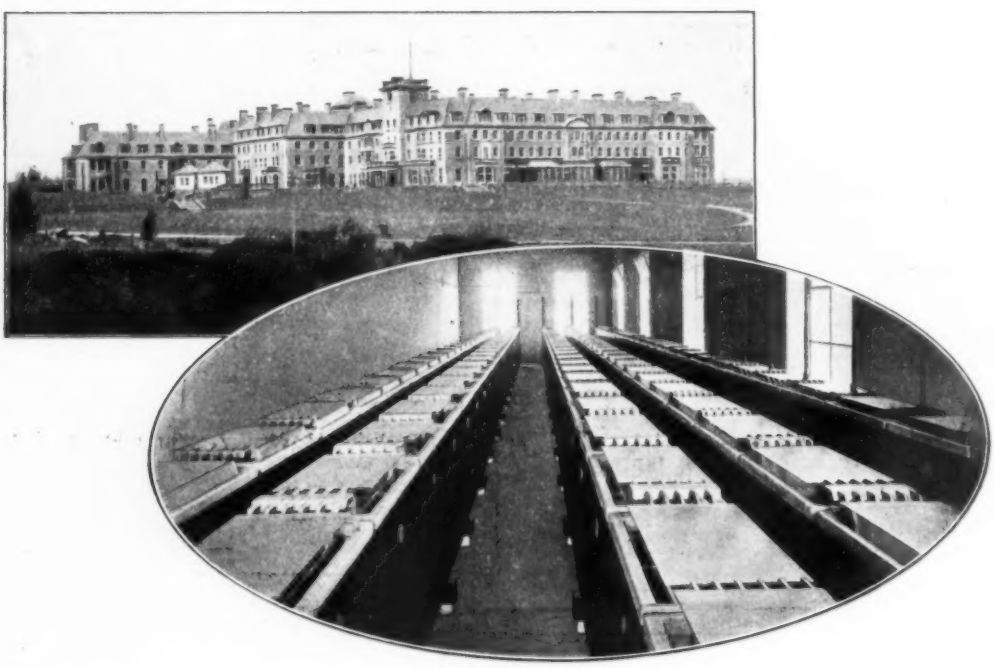

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BUSBARS and SECTIONS

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to Customers' requirements.

May we have your enquiries?

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Not one word lost!

JUST one man talking to a vast crowd. Talking in his ordinary voice, without the slightest indication of strain, and without raising his voice to any greater intensity than is required in ordinary conversation.

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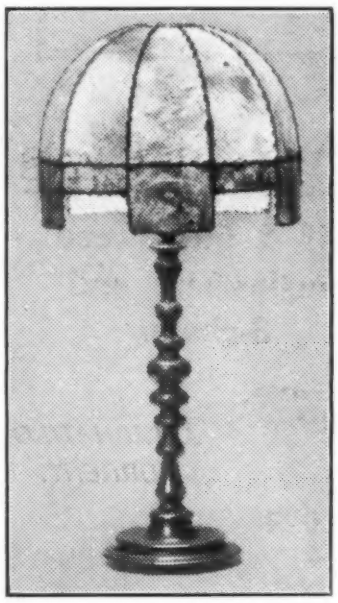

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RAPID BOILING PLATE No. 103.

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Tell your customers of the efficiency of the Arora "103" Rapid Boiling Plate.

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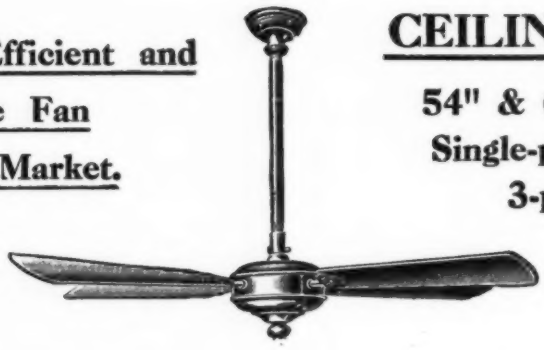

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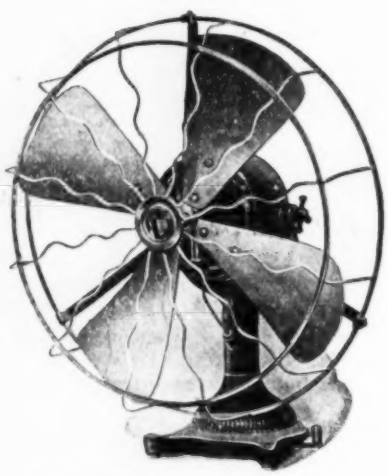

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These Fans are soundly constructed, silent in running, and dependable in every way.

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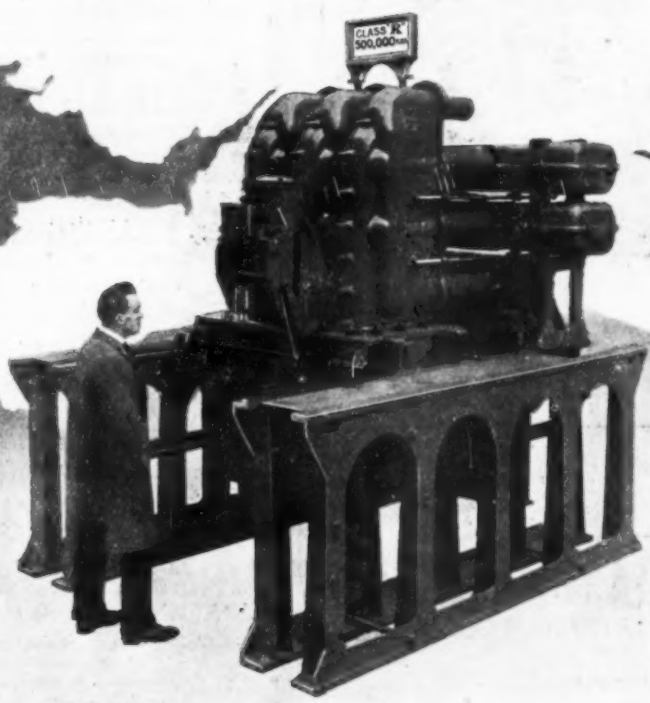

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How often do you get a report like this:—

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Your Annual Maintenance A/c may be small or large, one cannot tell; isn't it worth while to ensure at any rate that your Switchgear Maintenance is negligible or at the least reduced to a minimum?

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ALL electrical components or parts that are required to insulate should be moulded. Let this be your inflexible maxim. Porcelain will crack. Wood will split. Metal — even when lined with fibre—does not insulate.

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Will you write us for quotations, particulars and advice, or may our representative call and discuss the matter with you?

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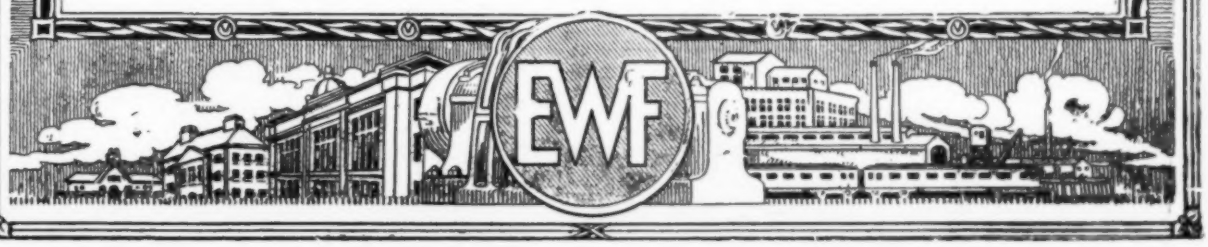

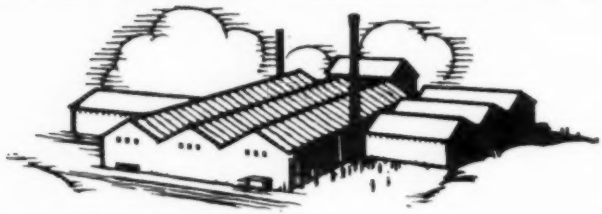

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4 Because our technical advisors are able to give individual attention to your problems. The lubricants we recommend will assure the most satisfactory and the least costly operation. Write to Dept. 33 for free advice.

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Large Stocks Kept—
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All Types:—
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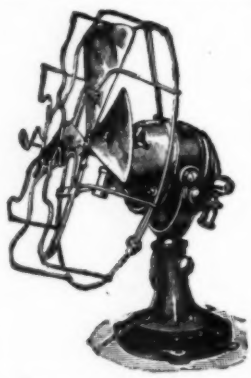
PORTABLE.
EXHAUST.
CEILING.



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6 & 8-inch FANS.

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Write for NEW Season's Catalogue No. 570.

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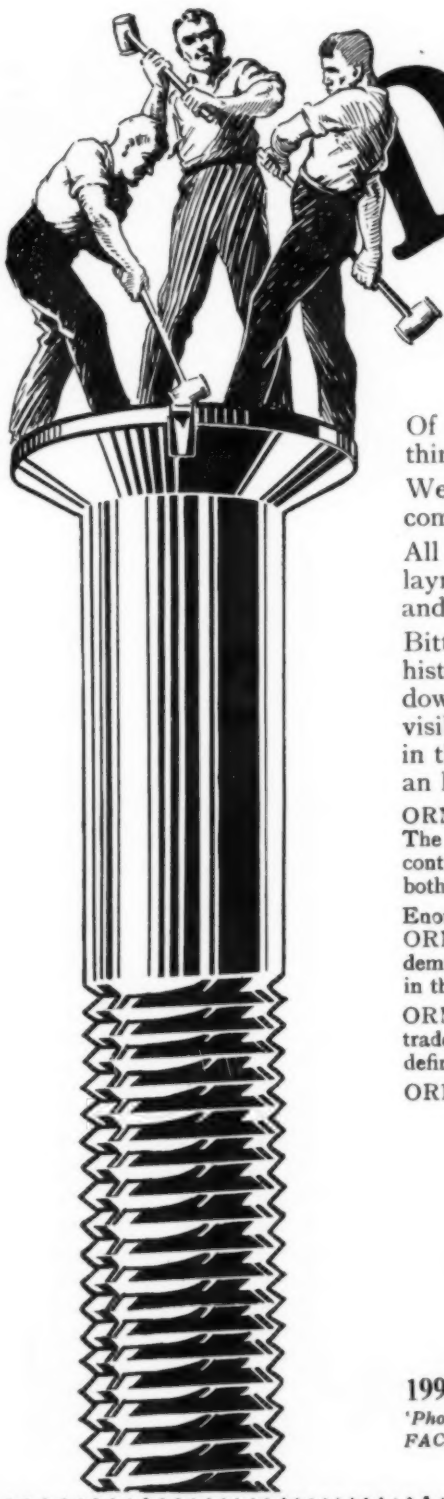

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Your screw will suffer

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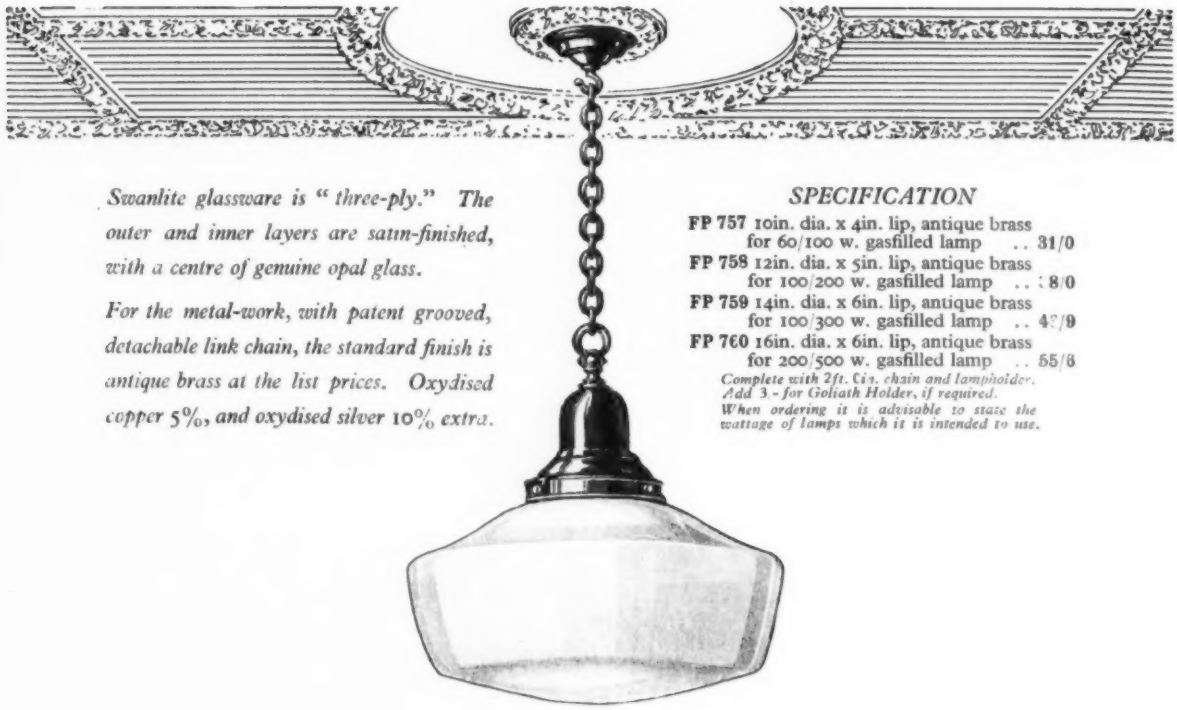

Swanlite glassware is "three-ply." The outer and inner layers are satin-finished, with a centre of genuine opal glass.

For the metal-work, with patent grooved, detachable link chain, the standard finish is antique brass at the list prices. Oxydised copper 5%, and oxydised silver 10% extra.

SPECIFICATION

FP 757 10in. dia. x 4in. lip, antique brass for 60/100 w. gasfilled lamp .. 31/0
FP 758 12in. dia. x 5in. lip, antique brass for 100/200 w. gasfilled lamp .. 38/0
FP 759 14in. dia. x 6in. lip, antique brass for 100/300 w. gasfilled lamp .. 48/9
FP 760 16in. dia. x 6in. lip, antique brass for 200/500 w. gasfilled lamp .. 55/8

Complete with 2ft. Cin. chain and lampholder. Add 3/- for Goliath Holder, if required. When ordering it is advisable to state the wattage of lamps which it is intended to use.

SWANLITE

THE DUST-PROOF UNIT

The attractive powers of light can have a detractive influence on sales. The Swanlite sells because it *helps to sell goods*. Swanlite is strong light, glareless—unostentatious; detracting no undue attention to itself, but displaying goods to best advantage. Every Swanlite is another efficient sales help—and with this lighting efficiency there is true beauty of design.

The Swanlite is pleasing in appearance, sound in design, dust-proof—no corners, no ledges to harbour dust and, therefore, very easily cleaned. This beauty, efficiency and utility explains why so many of the largest and most progressive Stores, Hotels and Restaurants are now Swanlite-ing. ◦ ◦ Your attention is directed to further particulars above.

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THE EDISON SWAN ELECTRIC CO. LTD

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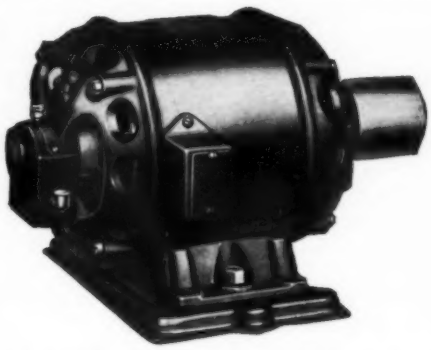

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CENTURY Repulsion-Start Induction Single-phase Motors—widely used on pumps, compressors, refrigerating machines and similar apparatus — are practically self-maintaining for at least a year.

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Built in all standard sizes from 1/8 to 40 horse-power—temperature rise not more than 40° Centigrade.

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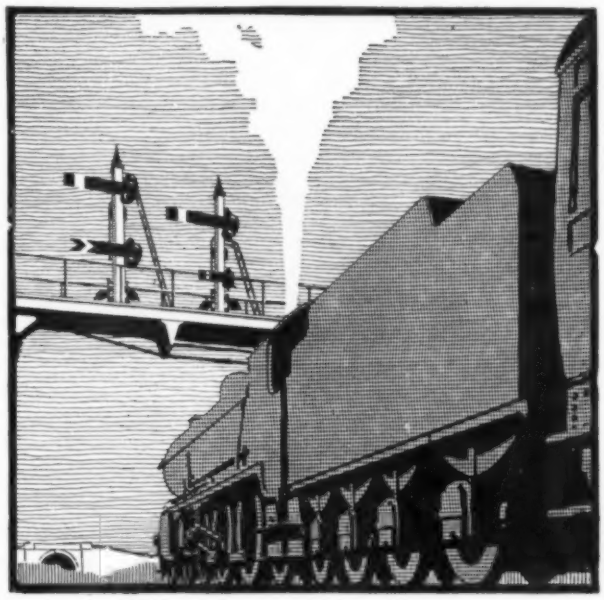
1/8 to 40 H.P. Century MOTORS 1/8 to 40 H.P.



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Made in ½ kW. outputs and upwards, for hand control, semi-automatic and full automatic working.

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The Inexpensive Way

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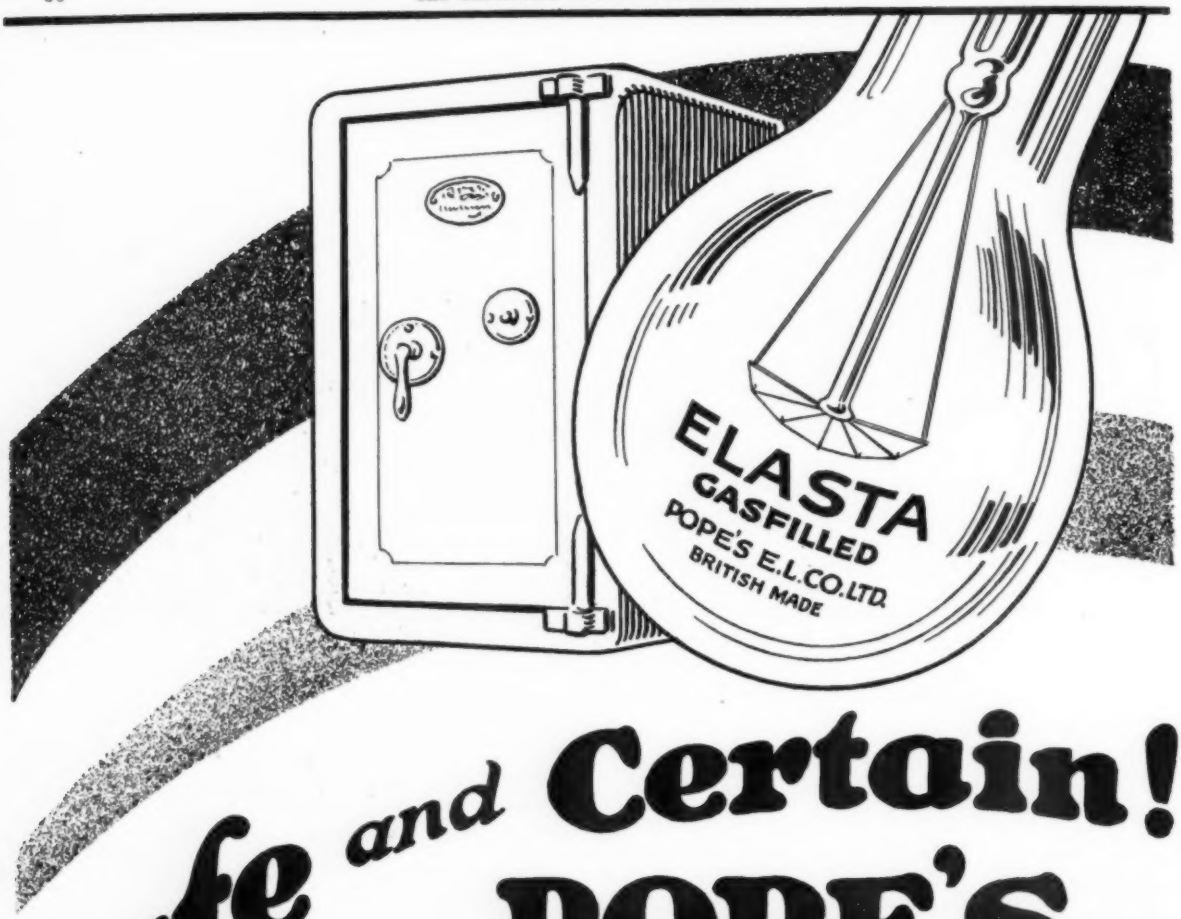

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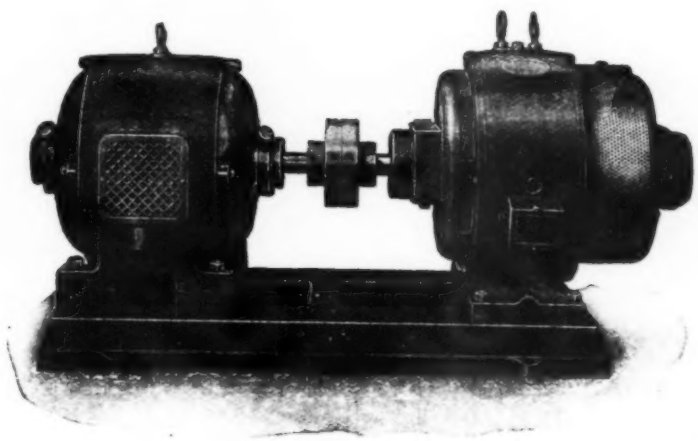

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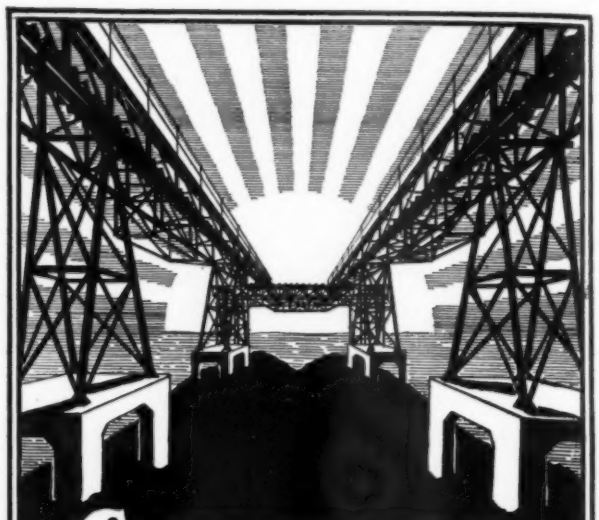

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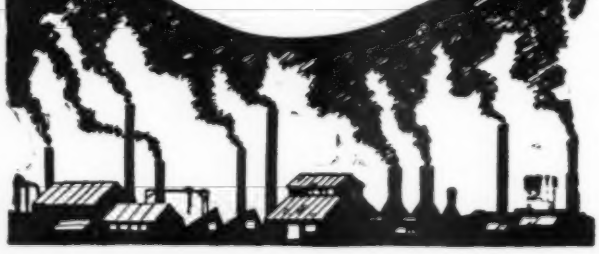
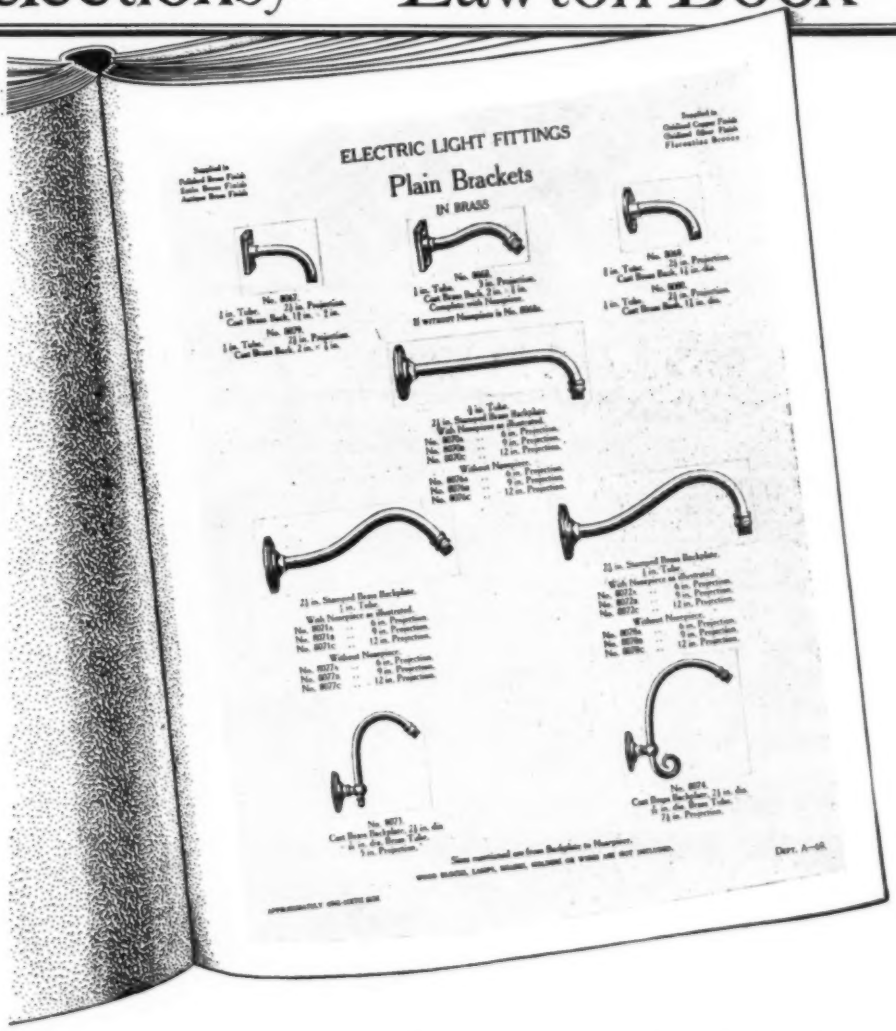


Selections *from the* Lawton Book



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June and July need not necessarily be such "dead" months as generally assumed. There are probably many of your customers who (while deferring extensive alterations to their lighting equipment till later) would welcome having some of their obsolete brackets removed and replaced by the inexpensive distinctive models we offer. Why not suggest to some of your customers that the time to do these little jobs is NOW?

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We can definitely claim that our Swan Necked Brackets are far superior in Quality and finish than others at the same price—are far better value, and offer really remunerative business to all handling them.

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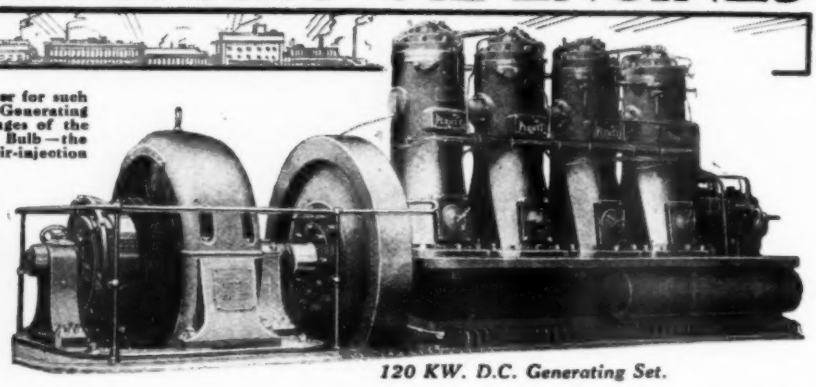

120 KW. D.C. Generating Set.

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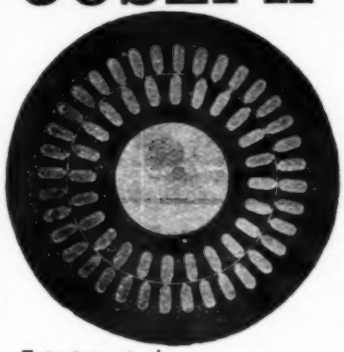

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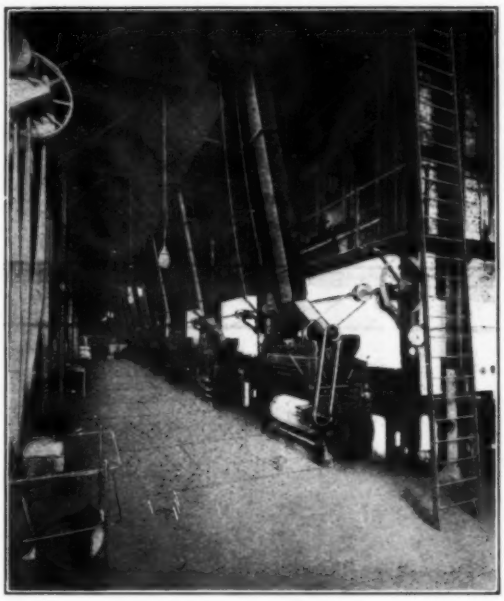

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Each fitting machined dead to gauge and tested and examined before despatch.
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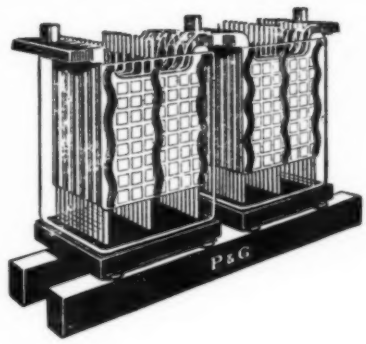

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Write for copies of Brochure No. 338 for circularising.

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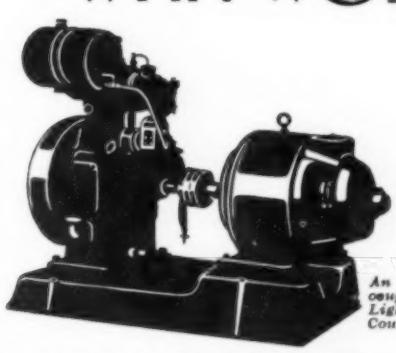

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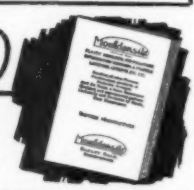

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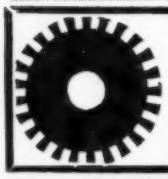

Armature, Dynamo and Transformer Stampings, Plain and Slotted—to customer's drawings or prints. Dynamo and Transformer Sheets, Swedish Iron Wire, Rods and Bars, black and bright drawn.
TURNER BROS., 134, Upper Thames St., E.C.
Telegrams: "Sheetiron, London." Telephone: 0855 Central.

THE SLYDLOK FUSE FOR
SWITCHBOARD INSTRUMENT PROTECTION.
All insulation, no earthing, small, light, neat and unobtrusive.
EDWARD WILCOX & Co. Ltd., Cross St., Lloyd St., Hulme, Manchester.

You want the best!
THEREFORE SPECIFY—

SEND FOR PRICES & PAMPHLETS TO
STERNS LIMITED.
ROYAL LONDON HOUSE, FINSBURY SQUARE
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(GENUINE AMERICAN.)
SHEETS, RODS, TUBES, BUSHES, DISCS, WASHERS.
SEND YOUR ENQUIRIES FOR ABOVE TO
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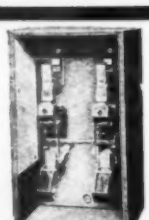
CONTROL IGRANIC ELECTRIC Co Ltd DEVICES
Write for Leaflet No. 370-A 235.

Dispense with troublesome fuses by installing
"U-RE-LITE" CIRCUIT BREAKERS
Illustration shows "U-RE-LITE" Senior with cover removed.

IGRANIC ELECTRIC Co. Ltd. 149, Queen Victoria Street, LONDON. Works - - - BEDFORD.



Ten Men held by one No 14 Rawlplug

Another Remarkable
Rawlplug Test

It is such a test as this which demonstrates the ability of Rawlplugs to support such tremendous weights, and gives both the public and the trade user that confidence in Rawlplugs that has made them the universal method of making fixtures in any material.

Sample Outfit, 5/6, Complete Outfit, £2

Write for Trade Booklet to :—
The RAWLPLUG Co., Ltd.,
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Bigger profits—this way!

Electrical High-Frequency treatment has long been recognised by the medical profession as being invaluable; consequently the demand for thoroughly efficient, yet low-priced equipment is enormous.

The Vio-Ray (Junior Model) Electrical High-Frequency Machine at 55/- (less generous discounts) is meeting these demands, and, being largely advertised in all leading medical journals, the demands are increasing. Shortly it will be advertised to the general public!

Take this big profit-making opportunity. Write for full particulars of the Vio-Ray machine **NOW!**

VIO RAY
HIGH FREQUENCY ELECTRICITY

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UP TO 1,000 K.V.A.

Over **60,000** Transformers have been manufactured at our Wimbledon Works.

STRONG, DURABLE, EFFICIENT.

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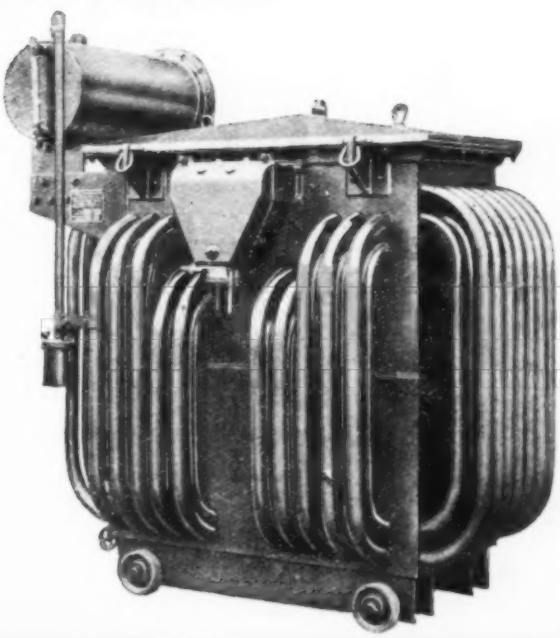

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Telephone: Wimbledon, 1800.
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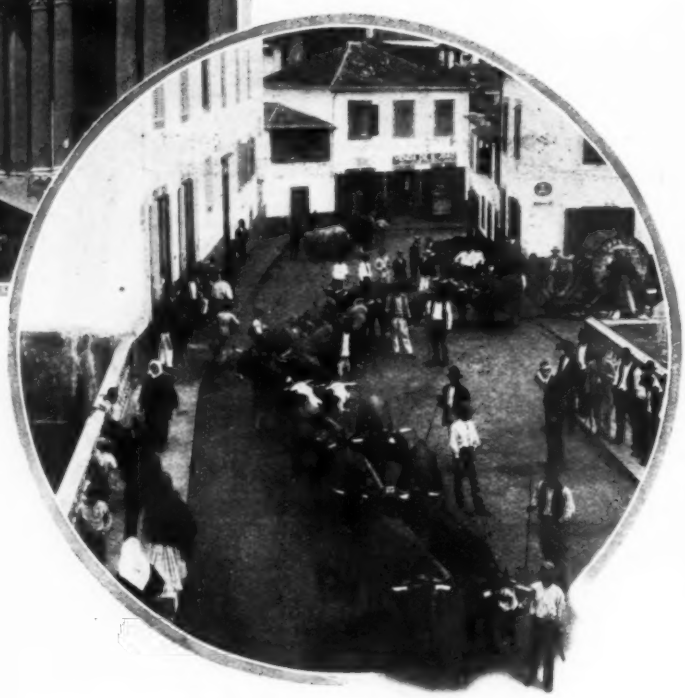
Pirelli-General Cable in St. Paul's Churchyard, London, E.C.



Oxen drawing a Pirelli-General Cable in Madeira.

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PIRELLI-GENERAL CABLES

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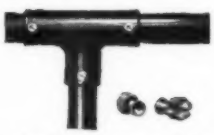

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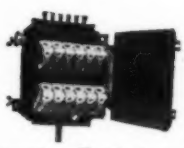
Durex System of Electric Wiring



Simplex "Diaduct" Distribution Boards

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Also Switch-Fuse Gear, Colliery Lighting Fittings, Window Reflector Signs & Lighting Fixtures.

When considering a Conduit Specification—

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There are only 3 things which you can specify with exactness on a conduit order—grade, size and finish; everything else is left open—quality of material, processes of manufacture, workmanship, etc.

This "Everything else" in SIMPLEX CONDUIT conforms throughout to the high Simplex standards and yet whilst increasing its worth many times, increases its cost not at all over that of the product of any other firm of responsible electrical engineers.

May we send you copies of the catalogues listing any of the materials shown alongside? You will then have both confirmation of the claims in this advertisement and also fullest information as to where and what to order next time.

Simplex YOUR installations

—it means longer service at a lower cost per year and at no increased initial outlay.

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Branches at:—LONDON, GLASGOW, MANCHESTER, BRISTOL, LIVERPOOL, LEEDS, NEWCASTLE, CARDIFF, NOTTINGHAM, SHEFFIELD, and also in all Principal Colonies.

Throughout the wiring of the charming old-English residence Notgrove Manor, Glos., Wandsworth Accessories were used.

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Wherever Wandsworth Switches and Accessories have been given an opportunity to prove their service, there will you find Architects, Consulting Engineers, and Electrical Contractors who specify and use them time and time again.

A WANDSWORTH PRODUCT GIVES A DEAL OF SATISFACTION.

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A.C. & D.C. MOTORS

possess all the essential qualities in both design and construction for successful working under the most exacting conditions imposed on the small motor. Under these conditions thousands of *CRYPTO* motors are upholding their high reputation

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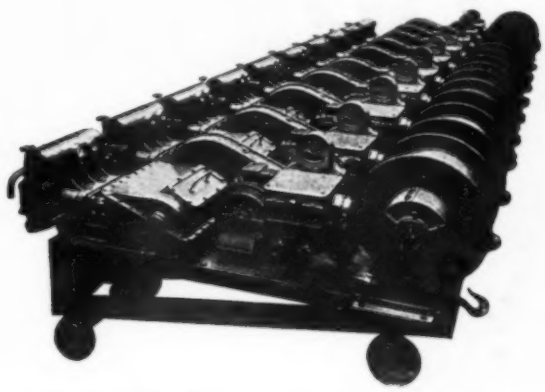

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dependable and economical service

D.C. and A.C.—Single, Two & Three Phase
From 25 H.P. down to 1/8 H.P.

Willesden, LONDON, N.W.10.

The LANCASHIRE DYNAMO & MOTOR CO. LTD. associated with The CRYPTO ELECTRICAL CO. LTD.

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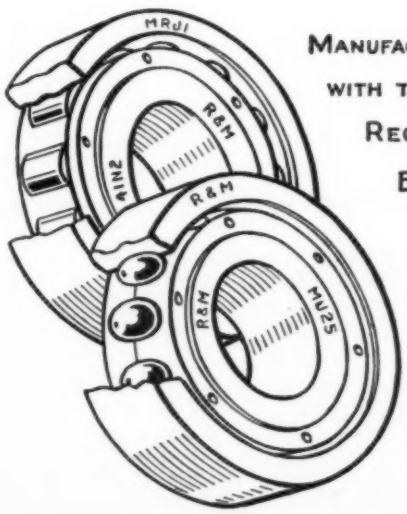
SPECIFY **R & M BEARINGS.**



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RANSOME & MARLES
BEARING Co LTD
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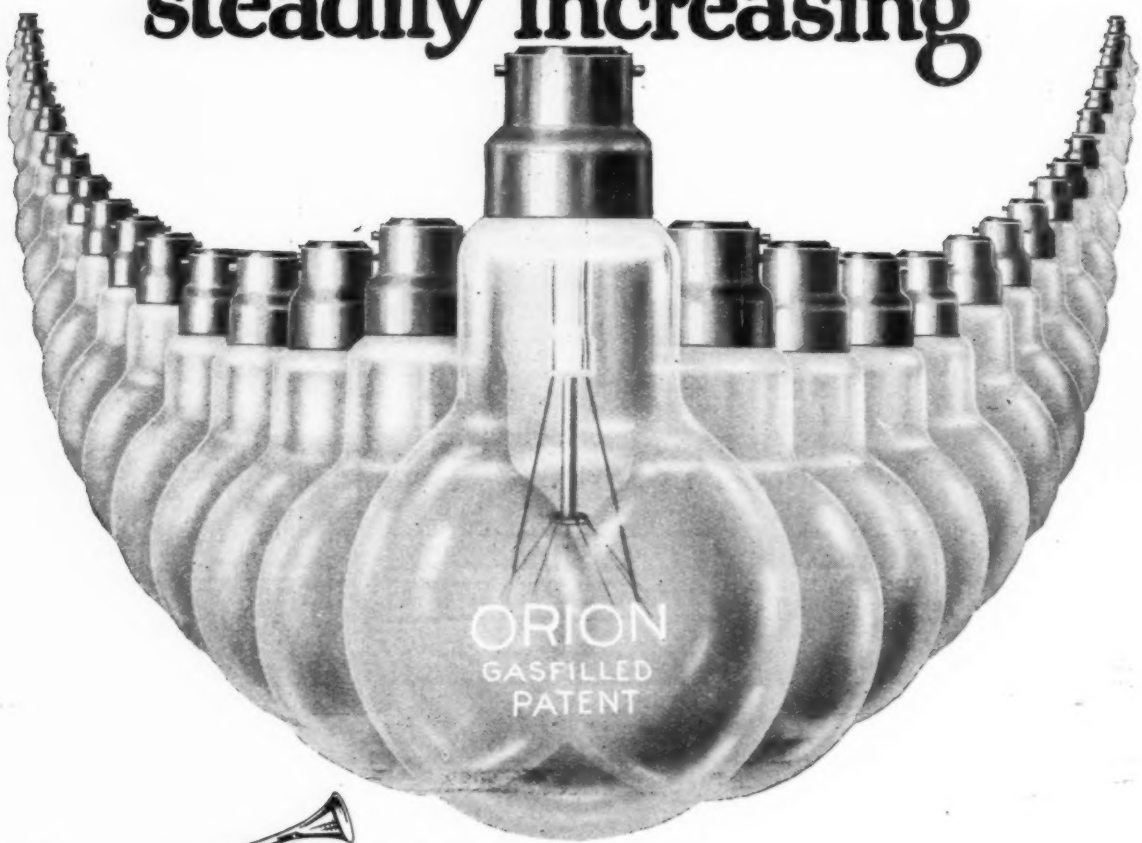
The Demand *for* ORION LAMPS *is* steadily increasing



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The Public know the world-wide reputation of Orion Lamps and appreciate their merits of brilliance, long life and low current consumption.

This ever-growing popularity, based on 40 years' specialised electrical experience, is the reason they are welcomed by the Trade as approved business building products.

COMMENCE YOUR SUMMER CAMPAIGN with the assurance of satisfying your customers' immediate requirements by stocking Orion Lamps, the perfect Lamp backed by a reliable service.

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Telephone: London Wall 7179.
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18, Scottish Temperance Buildings, Belfast.
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MADE BY THE FACTORY WITH 40 YEARS' SPECIALIZED EXPERIENCE IN ELECTRIC LAMP DESIGN AND MANUFACTURE

J. P. HALL & Co., Ltd.,

Telegrams: "DYNAMO, OLDHAM."
Telephone: 1901 OLDHAM (2 lines).

BLACKRIDING IRON WORKS, OLDHAM.

(Fig. No. 453.)
STANDARD OPEN TYPE
DIRECT CURRENT INTERPOLE DYNAMO FOR DIRECT COUPLING.

MANUFACTURERS OF

DYNAMOS & MOTORS

DIRECT AND ALTERNATING CURRENT

1 to 1,000 B.H.P.

The machines manufactured by us are the outcome of 40 years' experience in the design and construction of Dynamos and Motors for direct and alternating current circuits.

Many of our machines have been in continuous service for over 40 years in many parts of the world, and are still giving satisfactory service under the most trying conditions to which electrical machinery can be subjected.

SPECIAL MOTORS FOR CRANE SERVICE

Take a Batwin to pieces

OBSERVE first of all that D.C. Batwins from 1/8 H.P. upwards are a'l of FOUR-POLE CONSTRUCTION which provides a balanced magnetic field. It produces better commutation and more even torque than is possible with 2-pole construction usually offered on small motors. Note the laminated pole pieces. The sturdy construction and the careful finish. BATWINS will bear the closest inspection.

POWER CONTRACTS LTD
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Electrical Repair Work of Every Description.

REWINDING OF MOTORS and GENERATORS
OF ANY SIZE OR TYPE.
← *(Illustration shows large Rotor under Reconstruction.)*
COMMUTATORS & SLIP-RINGS SUPPLIED & FITTED.
ELECTRICAL MAINTENANCE.

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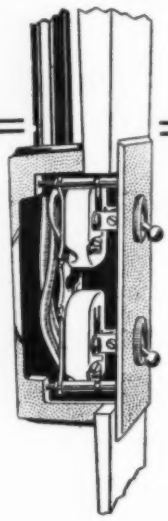
ESTABLISHED 1893.
Telephone: **NORTH 2066.** Telegrams: "Saturation, Norwest, London."

TUCKER TELAC

TUCKER



Adjustment up to ¼" Illustration shows Switchplate fixed with rings.

ADJUSTABLE GRID BOXES

FOR USE WITH TUCKER SWITCHES & ACCESSORIES.

TUCKER adjustable grid boxes, illustrated and described in this announcement, contain many features which will prove interesting to Engineers. They are constructed to the Tucker standard of quality throughout, ensuring long and satisfactory service, low erection costs and perfect installations.

SPECIAL FEATURES.

Adjustment up to ⅜".

All adjusting screws are turned in the same direction—

To the left—to raise, to the right—to lower.

The switchplate is always maintained at the correct distance from the Switches by being held firmly against the head of the adjusting screws which rise and fall with the grid.

The adjusting screws cannot be detached from the grid either before or after the Switches or Accessories are fitted.

The grid consists of a stout steel stamping, galvanized, and is consequently unbreakable and rust-proof. Its quick removal and replacement is assured.

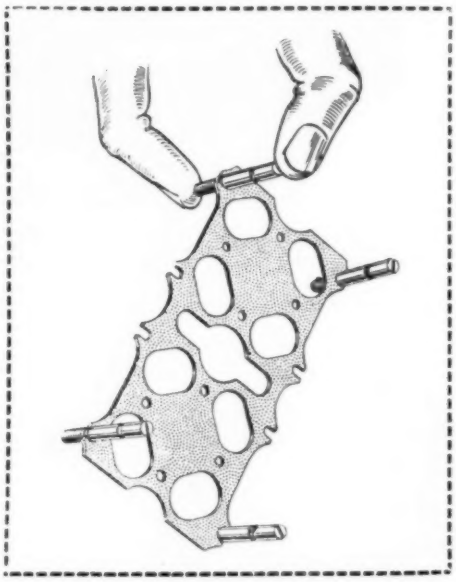


Illustration showing grid removed from box. Adjusting Screws cannot become detached.

CORNER FIXING ARRANGEMENTS.

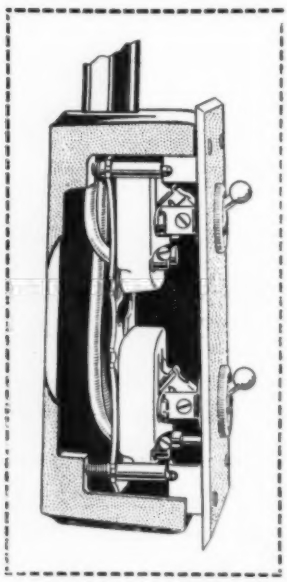


Illustration showing Switchplate fixed with corner fixing screws.

Hitherto, great trouble has been experienced in fixing the switchplate with corner fixing screws owing to the "tilt" of the plate, and the resulting difficulty of engaging screw threads in the tapped holes of the box.

In the Tucker adjustable grid boxes this has been overcome by a special patented feature, whereby the tapped holes to receive the fixing screws are located in brackets attached to the adjusting screws. These brackets are consequently always parallel to the Switchplate, rising and falling with the adjustment.

Descriptive Folder No. S.1, complete with prices, will be gladly sent on request.

J. H. Tucker & Co. Ltd

KINGS Rd TYSELEY BIRMINGHAM

BRANCH OFFICES:

LONDON — GLASGOW — DUBLIN — BELFAST

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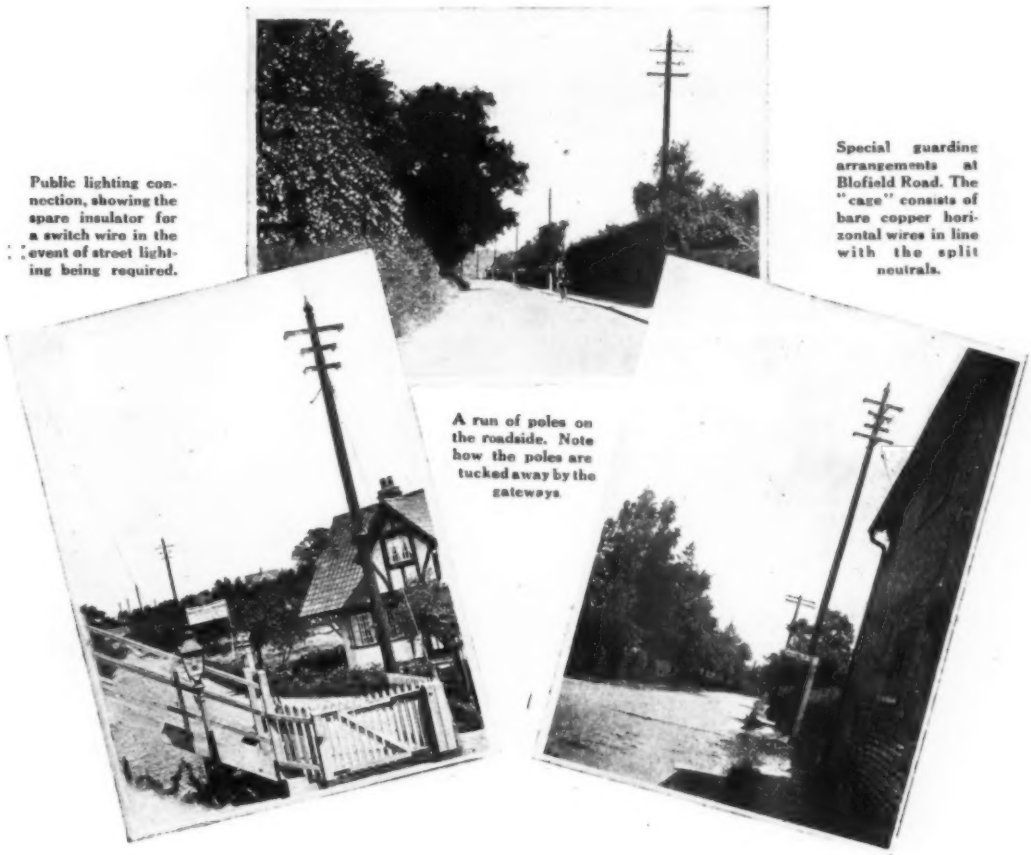

Public lighting connection, showing the spare insulator for a switch wire in the event of street lighting being required.

Special guarding arrangements at Blofield Road. The "cage" consists of bare copper horizontal wires in line with the split neutrals.

A run of poles on the roadside. Note how the poles are tucked away by the gateways.

Lighting Schemes

The illustrations show views of the village lighting and power scheme at Brundall, Norfolk, which serves the parishes of Brundall, Blofield and the surrounding areas.

The Main Cables are laid underground from Norwich, the current being distributed by overhead bare copper wires carried on wooden poles. The length of the main overhead line is about 1½ miles.

Henley's were responsible for the overhead work, transformer house, switchboard, etc., the Consulting Engineer being Mr. G. T. Redgment, of Norwich.

Henley's have unique experience in the electrification of town and country areas and are able to carry out schemes of any magnitude—overhead or underground.

HENLEY CABLES and overhead lines

772

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THERE IS PROFITABLE BUSINESS for YOU in "EVERAY" & "ICALL" Electro-medical Apparatus

THE remarkable curative properties inherent in Violet Rays are responsible for the ever-growing demand for High Frequency Instruments generally, and "EVERAY" particularly, which are recognised to be the most reliable instruments on the market.

THE illustration depicts "Type B" Portable Apparatus for Universal Voltage. This model is most popular with the medical profession on account of its efficiency and reliability. The retail price is £6 6s.—a most generous trade discount is allowed to all *bona fide* traders.

PROGRESSIVE Electrical Engineers are taking full advantage of the business possibilities in the public demand for these high-grade instruments, and their increasing sales throughout the world testify to their great commercial value.

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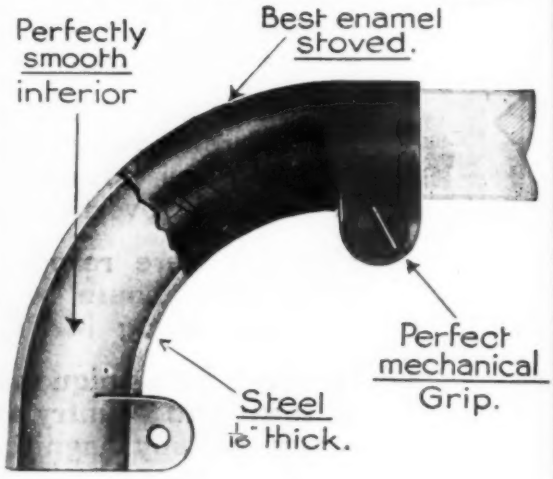
ALL STEEL CONTINUITY FITTINGS



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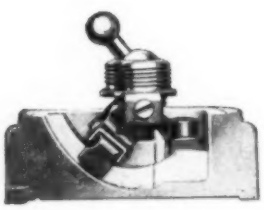

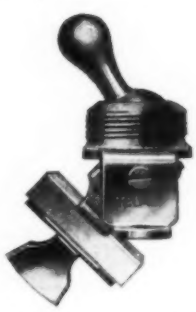

Why

THE TUCKER B4000

is

SOUND

ELECTRICALLY *AND* MECHANICALLY

COMPLETE POSITIVE ACTION

It will be seen from the illustration that the contact arm is *positively* and *mechanically* controllable throughout its entire stroke, by the movement of the "dolly" and is not fundamentally dependent on the spring, which is therefore called upon to act in the proper capacity of a spring, i.e., as an accelerator and not as a prime mover.

EXCEPTIONALLY LONG BREAK

The load breaking abilities are exceptional —the "break" being longer than in any switch of a similar type.

The standard 5 ampere single pole switch has successfully dealt with a load of 33 amps. at 250 volts, and with its normal rated current of 5 amps. at 525 volts,

on independent tests.

HIGH INSULATION VALUE

15 AMPERE SIZE.

Otherwise of the same general design and construction as the 5 ampere size the 15 amp. is fitted with and the actual contact arm mounted upon a solid insulator of Mica and Steatite – giving a very high insulation value.

J. H. Tucker & Co. Ltd.

KINGS Rd TYSELEY BIRMINGHAM

CONTRACTORS' COLUMN.

(These particulars of new building schemes are published for the use of contractors and others in search of possible electrical business. Every care is taken by our correspondents to ensure accuracy; if alleged errors are reported to the Editors they will be fully investigated.)

ASHBY-DE-LA-ZOUCH.—Additional 40 houses, for the R.D.C.; surveyor.

AUDENSHAW (MANCHESTER).—Re-erection of hat works, Stamford Road, for Robert Fox & Co.

BARGOED.—Re-erection of by-product plant, for the Powell Duffryn Steam Coal Co., Ltd. (£20,000).

BARNSLEY.—68 houses, Carlton site; Clarke & Squire. New hotel, Cliffe Cross; Barnsley Brewery Co. Housing scheme, Worsborough site; borough engineer.

BEDDINGTON AND WALLINGTON.—Housing scheme (40), Beddington Corner, for the U.D.C.; surveyor.

BEDWAS.—Housing scheme (40), Machen, for the U.D.C.; Idris Leyshon, architect.

BIGGLESWADE (BEDS.).—Housing scheme (90), for the U.D.C.; T. R. Howitt, surveyor.

BIRKENHEAD.—Kinema, Bidston Avenue; T. T. Rees, architect. Housing scheme (22), for the T.C.; Charles Brownridge, borough engineer.

BLANTYRE.—Child welfare centre and health institute, with electrical work, for Lanarkshire C.C.; P. C. Smith, District Offices, Hamilton.

BOURNEMOUTH.—Church, Wooton Gardens; trustees. Shops, offices and bank, Wimborne Road; H. C. Barnes. Fire station, Wimborne Road; borough engineer.

BRADFORD.—12 combined shops and houses at No. 3 Bradford Moor housing scheme; city architect.

BRENTWOOD.—Girls' high school, with electrical work, for Essex E.C.; J. Stuart, county architect, Springfield Old Court, Chelmsford.

BROMLEY (KENT).—Administrative block, isolation hospital, for the Bromley and Beckenham Joint Hospital Board; A. B. Coomber, clerk

BUSHBURY (STAFFS.).—Works, Fordhouses, for the Uniflo Pump Co.

CAERPHILLY.—Housing scheme (48), Nantgarw, for the U.D.C.; B. Jenkins, housing officer.

CALDAY GRANGE.—Schools (£22,625), for Cheshire E.C.; F. A. Browne, county architect, Chester.

CANNOCK.—Additional 58 houses, St. John's estate, for the U.D.C.; S. Harrison, architect.

CARLISLE.—Estate scheme, Upperby Road; Harrison Bros.

CLARKSTON.—Secondary school; Renfrewshire Education Authority.

COVENTRY.—Residential school, Corley, for the borough E.C.; F. Smith, clerk.

CROMPTON (LANCS.).—Additional 48 houses, for the U.D.C.; surveyor.

DONCASTER.—Premises and showrooms, for C. H. Pickles, Ltd., Leeds; Hustler & Taylor, architects, Pontefract.

DORCHESTER.—26 houses; C. W. Pike, for Corporation.

DOUGLAS.—Extensions, mental hospital, for the Isle of Man Asylums Board; J. E. Teare, architect, 46, Athol Street.

DUMFRIES.—Housing scheme (98), Cresswell, for the T.C.; John Barker, burgh surveyor.

EAST KILBRIDE.—School extensions, Hairmyres Colony, with electrical work, for Lanarkshire E.C.; P. C. Smith, District Offices, Hamilton.

ECCLES.—Housing scheme (68), Edison Road, Patricroft, for the T.C.; borough surveyor.

EDINBURGH.—New mining school (£23,500); clerk, George Heriot's Trust, Edinburgh.

ELY.—Housing scheme (50), for the R.D.C.; H. F. Wykes, architect, Downham Road.

ETON.—Houses (50), for the U.D.C.; Lacey & Sons, builders.

EXETER.—Houses (114), for staffs, for Devon C.C.; county architect.

FARINGDON.—Girls' schools, for Berkshire E.C.; W. C. F. Anderson, secretary, Shire Hall, Reading.

FARNBOROUGH (HANTS.).—Kinema, Camp Road, with electrical work, for Charles Darby; Robert A. Briggs, architect, Shripney, Bognor, Sussex. Business premises, Alexandra Road, for Oakey & Sons.

FIFESHIRE.—Reconstruction of Newburgh railway station, for L. & N.E. Railway Co., after fire; engineer, Edinburgh.

GILLINGHAM (KENT).—Housing scheme (44), Woodlands site, for the T.C.; borough surveyor.

GLASGOW.—Building in David Street, Mile End; Roman Catholic Church trustees. Picture house at Kilmarnock Road; Albert E. Pickard, theatre proprietor, 101, Trongate. Housing scheme at Tollcross (£40,500), for Corporation; city architect. Church hall in Anderston, for Cranstonhill U.F. Church; the minister.

HARROGATE.—Additional 50 houses, for the T.C.; borough surveyor.

HASTINGS.—Hotel, restaurant, shops, &c., White Rock, for Palace Chambers (Hastings), Ltd.; S. H. Burdwood, architect, 80, George Street, Portman Square, London, W.

HATFIELD (HERTS.).—Electric light installation, Parish Church; Parochial Council secretary.

HITCHIN (HERTS.).—Housing scheme (70), West Mill Lane site, for the U.D.C.; surveyor.

HOUGHTON-LE-SPRING (CO. DURHAM).—Additional housing scheme (26), for the U.D.C.; surveyor.

INVERNESS.—Alterations (£3,600), for Woolworth & Co., Ltd.; the manager.

KNARESBOROUGH.—20 houses, for U.D.C., Stockwell Road; S. Blenkhorn, architect, Bondend.

LONDON (CAMDEN TOWN, N.W.).—Rebuilding "Gipsy Queen," Malden Road; licensee.

(BERMONDSEY, S.E.).—Rebuilding shops, 188-194, Southwark Park Road, and 145, St. James's Road; Leighton & Higgs.

(CAMBERWELL, S.E.).—Flats on site off Champion Park; R. W. K. Goddard.

(ELTHAM, S.E.).—Additional 500 houses, Well Hall, for Woolwich T.C.; borough surveyor. Schools, Well Hall estate, for the London Education Committee.

LONDON—*continued.*

(WOOLWICH, S.E.).—500 houses, Eltham; borough engineer.

(FULHAM, S.W.).—Buildings, corner of Broughton Road and Bulow Road; Loud & Western, Ltd.

(EAST HAM, E.).—38 garages, Flanders Road; S. H. Anstead. Extensions, electricity works, Elizabeth Road; Dawson, Son and Allerdyce. Store, High Street Market; L. G. Elkins. Forty houses, Central site; borough engineer. 30 houses, Central Park Road; F. Hamlett. 44 houses, Charlemont Road; R. Cheke and Co. (Wanstead), Ltd.

LUTON.—Shops and showrooms, George Street; Hillier, Parker, May and Rowden. Ten houses and shops, Dunstable Road, for J. Frost.

LYE.—Additional 52 houses, Brook Crescent estate, for the U.D.C.; H. E. Folkes, surveyor.

LYTHAM-ST. ANNES.—Girls' secondary school, for the governors of Lytham School Charities; the clerk.

MACCLESFIELD.—Board room and offices (£4,600), for the R.D.C.; G. Clayton, architect.

MANCHESTER.—New Masonic temple; R. V. Clayton, 2, Cooper Street.

MERTHYR TYDFIL.—Additional 52 houses, Heolgerrig, for the T.C.; borough architect.

NEWCASTLE.—26 houses, Wharrier estate. 34 houses, Walker estate; G. G. Carr. 230 houses, Walker estate; H. Kelly (Contractor), Ltd.

NORTHAMPTON.—Electric lighting installation, Clare Street headquarters, for Northants. Territorial Army Association; Major J. A. C. Wetherall, secretary.

NORTON (YORKS.).—Schools, for West Riding E.C.; F. A. Darwin, clerk, County Hall, Wakefield.

OTLEY.—Extensions, Atlas Works; Dawson, Payne & Elliott. 56 U.D.C. houses, Harefield estate; Council surveyor, North Parade.

PAISLEY.—New premises for Paisley Savings Bank; the manager. Dance hall, tea lounge, &c., for Paisley Plaza, Ltd., 114, West Campbell Street, Glasgow; the secretary.

PETERBOROUGH.—Headquarters, for the Northants. Territorial Army Association; J. W. Fisher, architect, Burystead Place, Wellingborough.

PLYMOUTH.—44 garages, showrooms, workshops, &c., Stuart Road, Penny Comequick; W. Reed. Estate scheme, Lower Compton; H. J. Hammick.

PONTEFRACT.—New hotel at Upton, for Wm. Pickersgill & Co., Ltd.; Garside & Pennington, architects, Ropergate.

POOLE.—Garden village scheme, Wallis Down, for a local syndicate; particulars from the Mayor, Alderman H. S. Carter.

RICHMOND-ON-THAMES.—Housing scheme (63), Manor Road estate, for the T.C.; borough engineer. Extensions to Greyhound Hotel; Brewer, Smith & Brewer, architects.

ROMFORD.—Houses (20), Pettits Lane, for H. J. Finch. Houses (18), Collier Row Lane, for Limbert & Walker.

RUNCORN.—Houses (21), Cornwall Street, for W. H. Davey & Co., Ltd.

RYHOPE (CO. DURHAM).—Extensions to Parish Church (£4,300); Hicks and Charlewood, architects, Newcastle-on-Tyne; A. Pringle, Ltd., builders, Gateshead.

SALFORD.—Secondary schools (£25,000), Weaste Lane, Pendleton, for the De la Salle Roman Catholic College; the principal.

SHANKLIN (ISLE OF WIGHT).—Municipal offices, for the T.C.; E. C. Cooper, architect, Post Office Chambers.

SOUTHAMPTON.—Extensions to University College, for the Council; the registrar.

SOWERBY.—Extensions to New Road schools (£5,000), for West Riding E.C.; Director of Education, County Hall, Wakefield.

SPALDING.—Kinema; Percy L. Brown & Son, architects, Newcastle-on-Tyne.

STAFFORD.—Housing scheme (52), Tithe Barn estate, for the T.C.; W. Plant, borough engineer.

STARCROSS.—Colony for defectives; Plymouth Corporation and joint authorities.

STORNOWAY.—Reconstruction of municipal buildings and library, for the T.C.; J. G. Chisholm, architect, 15, Union Street, Inverness.

STRETFORD.—Church, for St. Cuthbert's, Third Avenue; Robert Martin, architect. Dance hall, Chester Road; J. Hayes. 38 houses, off Barton Road; J. W. Maunders. Baths, Trafford Park; U.D.C. surveyor. Proposed 340 houses, Trafford estate; U.D.C. surveyor.

STUBBINS (RAMSBOTTOM).—New St. Philip's Church; Robert Martin, architect, Deansgate, Manchester; Leonard Clough, Ltd., builders, Adlington, Chorley.

SWANSEA.—Church hall, Cwm Level Road, Landore; Rev. T. Harrington. Additions, Horeb Congregational Church, Morriston; trustees. Estate development, Trigwl Farm, St. Thomas; E. R. Griffiths, architect for Grenfell Estate Co. Remodelling old Waverley Hotel premises, Cradock Street; Blewitt, Jenkins & Son. Public utility housing scheme, Waunwen Road; Church Army Housing, Ltd. 150 houses, Maesteg; J. & F. Weaver. Police station, Llansamlet; John Goodridge & Son, Neath.

TUNBRIDGE WELLS.—Extensions, General Hospital (£80,000), for the governors; secretary.

WAKEFIELD.—Additions to Clayton Hospital; W. H. Watson, architect, Barstow Square, Wakefield.

WINCHESTER.—Housing scheme (68), for the R.D.C.; Haynes, Johnson and Ebbs, architects, 95, High Street.

WINTON (MANCHESTER).—New St. Michael's Church; R. Martin, architect; Ginger, Lee & Co., builders, Longsight, Manchester.

WORTHING.—Development of Findon Valley estate, for the Findon Valley (Worthing) Estate Co., Ltd.; J. H. Gray, managing director, 15, Harringay Park, Crouch End, London, N.8.

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by the

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The term **"Non-Association"** was introduced by the Cable Makers' Association in 1905 to distinguish cables of the second quality from the **"Association Grade"** (first quality) Cables of its members. For some time it has been urged upon the C.M.A. that the description is being applied by manufacturers at Home and Abroad who are not members of the Association, to their own cables, which are sometimes of inferior quality. This has caused confusion and possible loss to buyers of electric cables, and it is felt that some definite distinction is necessary.

Buyers of Electric cables will, therefore, be glad to know that the Registrar of Trade Marks has recently registered in the name of the **Cable Makers' Association,** as a new Trade Mark the word

NONAZO

Registered No. 458865.

After March 31st, 1926, this registered Trade Mark will be introduced on the labels of "Non-Association" Class Cable made by all members of the Cable Makers' Association.

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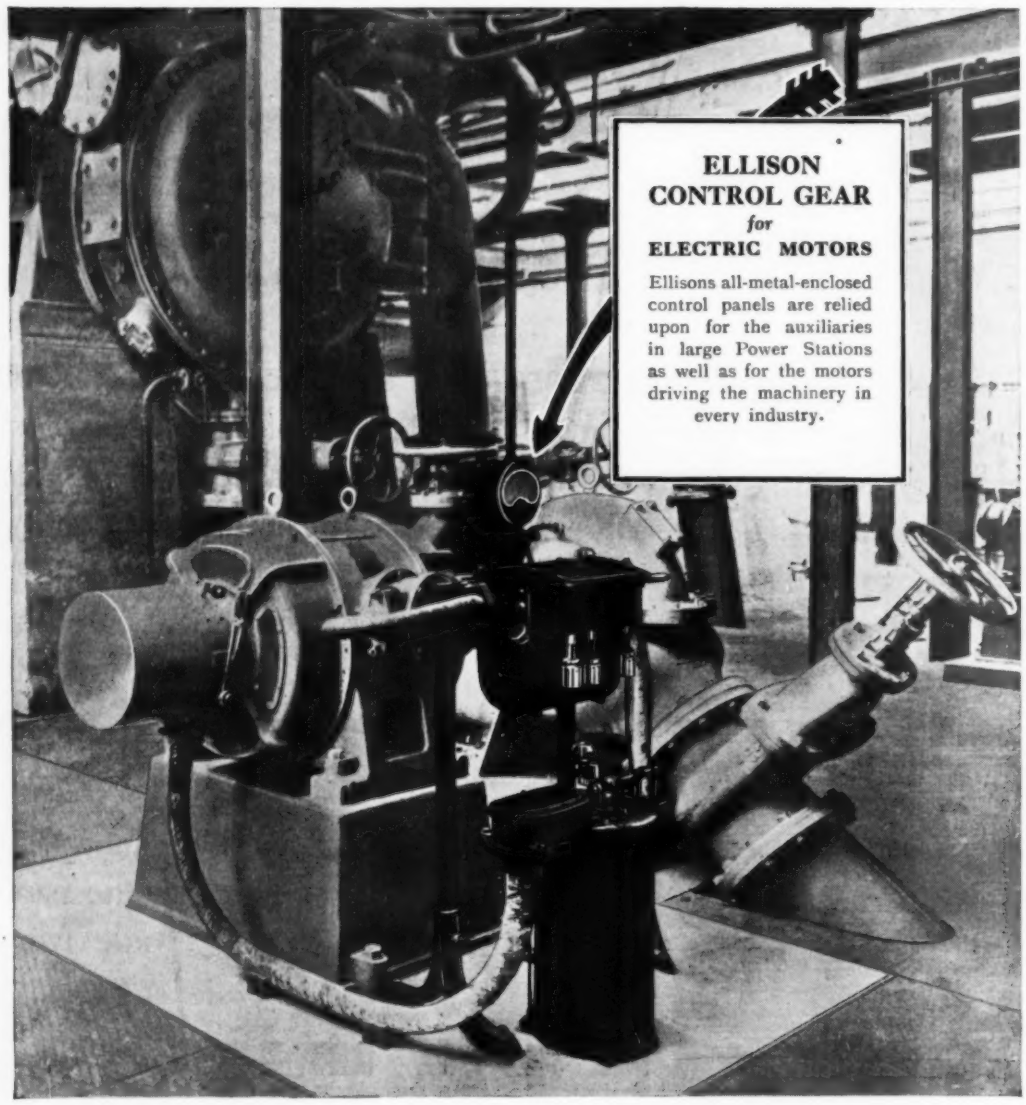
W. T. Glover & Co., Ltd.
W. T. Henley's Telegraph Works Co., Ltd.
The India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
Johnson & Phillips, Ltd.
Liverpool Electric Cable Co., Ltd.
The London Electric Wire Co. and Smiths, Ltd.
The Macintosh Cable Co., Ltd.
Pirelli-General Cable Works, Ltd.
St. Helens Cable and Rubber Co., Ltd.
Siemens Brothers & Co., Ltd.
Standard Telephones and Cables, Ltd. (formerly Western Electric Co., Ltd.).
Union Cable Co., Ltd.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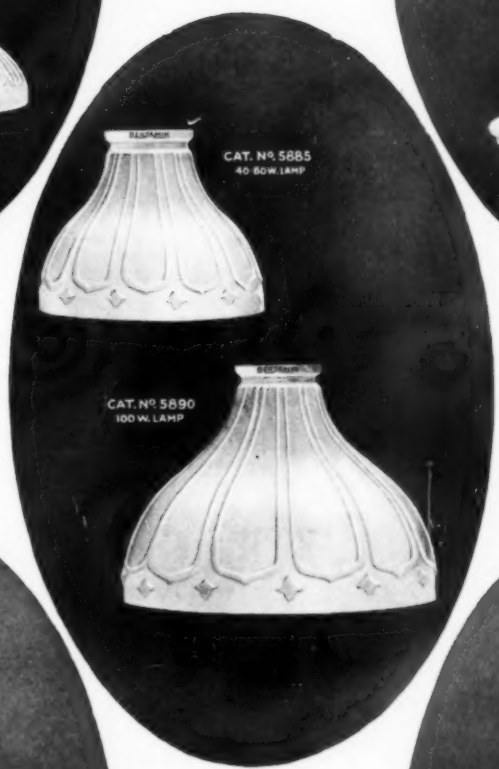

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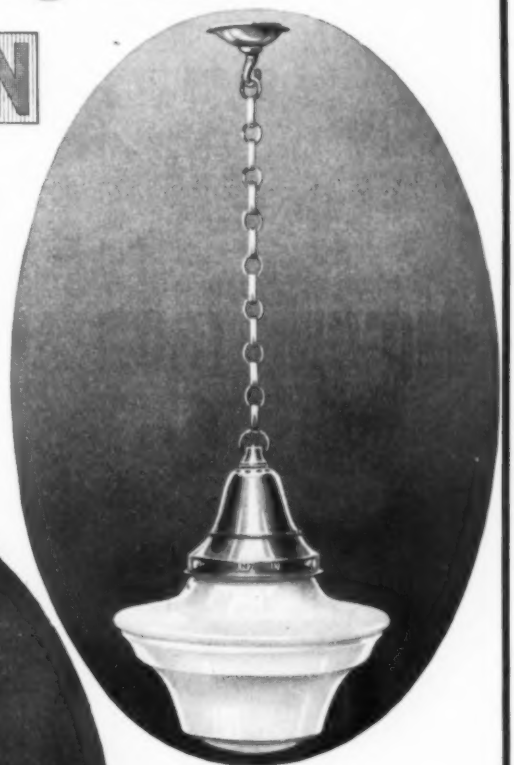

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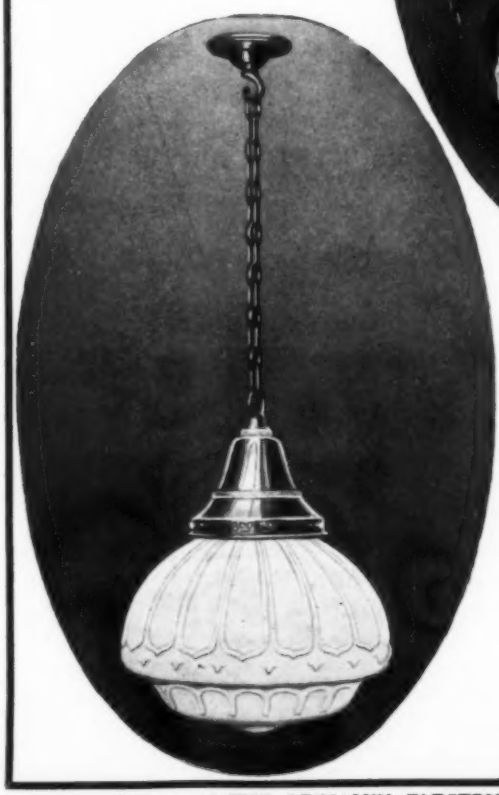

(Left)

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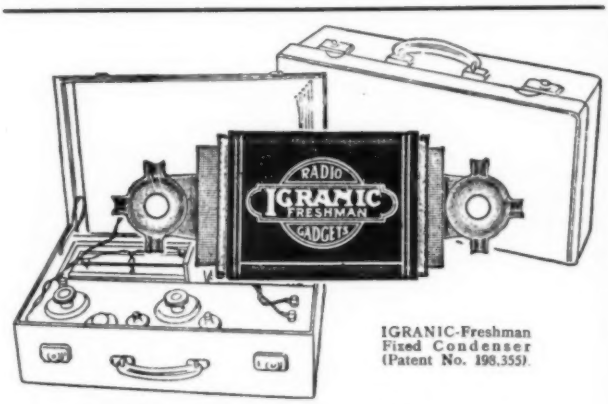

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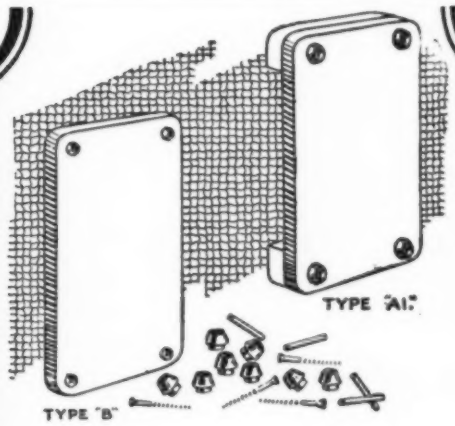

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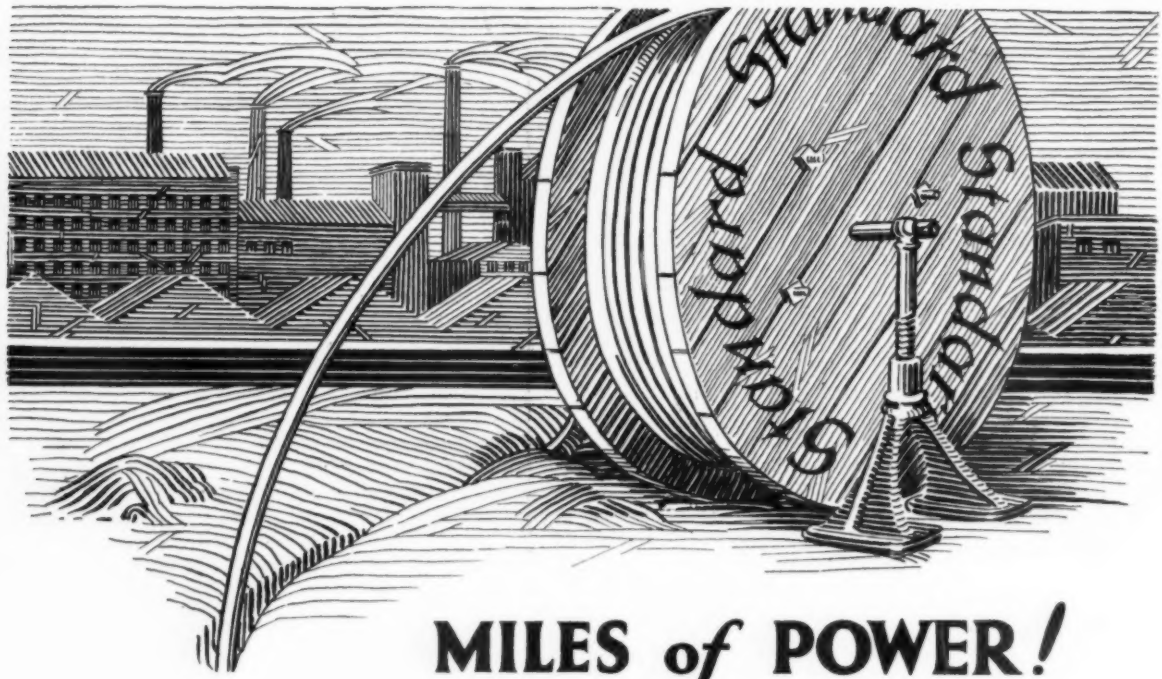

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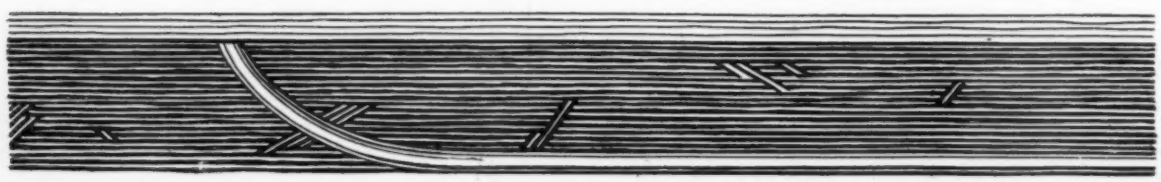

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„ 1b ...	21 × 12 ins. ...	33 × 17 ins.	
„ 2 ...	21 × 14 ins. ...	33 × 17 ins.	
„ 2a ...	21 × 16 ins. ...	33 × 17 ins.	
„ 2c ...	21 × 18 ins. ...	33 × 17 ins.	46½ ins.
„ 2b ...	25 × 14 ins. ...	36 × 21 ins.	49 ins.
„ 3 ...	25 × 16 ins. ...	36 × 21 ins.	
„ 3a ...	25 × 20 ins. ...	36 × 21 ins.	
„ 3b ...	31 × 16 ins. ...	36 × 27 ins.	49½ ins.
„ 4 ...	31 × 20 ins. ...	36 × 27 ins.	
„ 5 ...	36 × 24 ins. ...	42 × 33 ins.	55½ ins.
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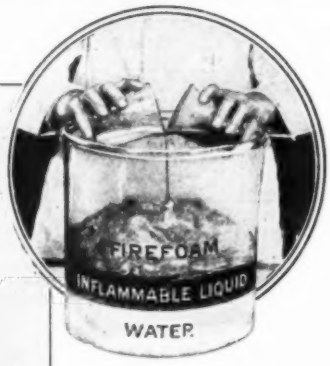

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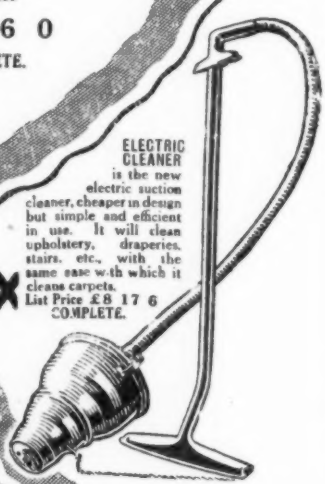

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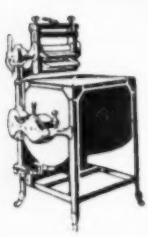

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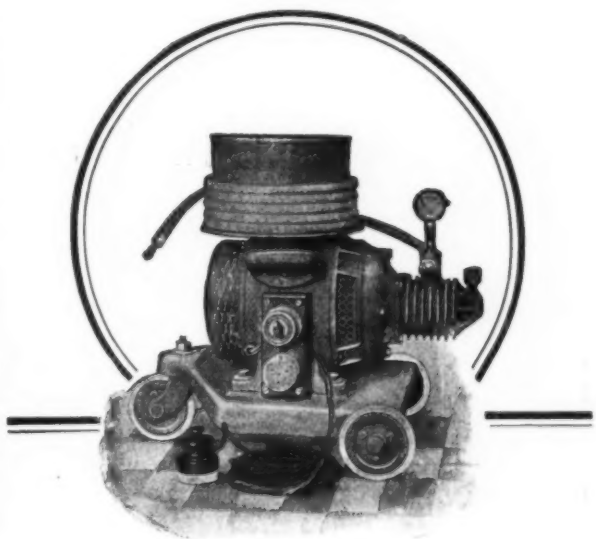

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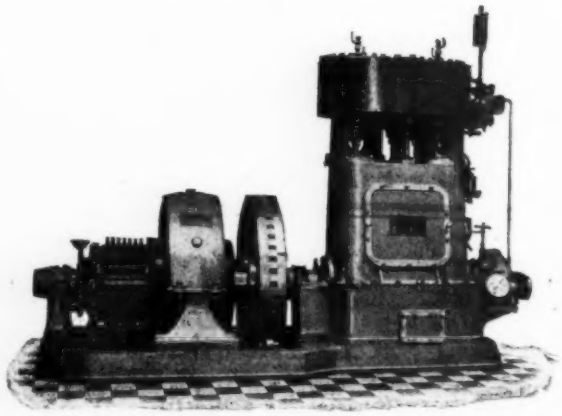

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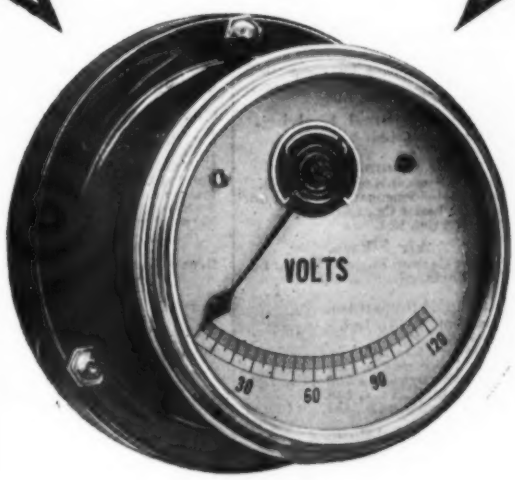

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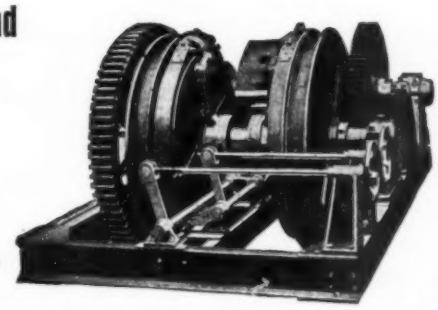

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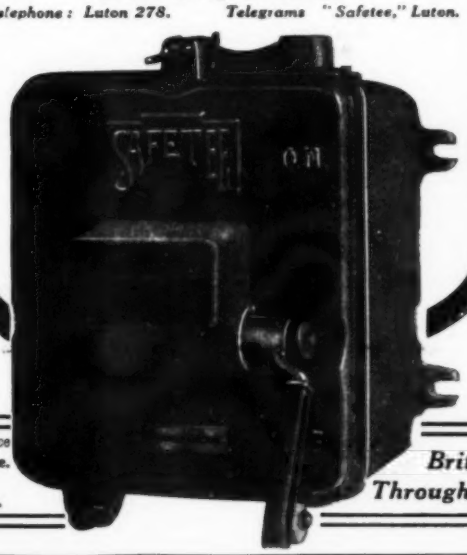

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CONTINUED ON PAGE LII

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CUSTOMERS now no longer buy "any old loud speaker." It is *tone* that matters in wireless now . . . and the Ericsson Super Tone has forged ahead on *tone*. Made by a firm with a generation's experience in telephone manufacture what else could follow?

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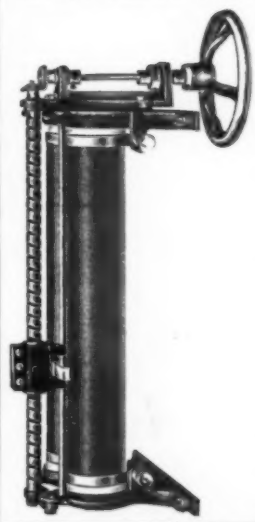

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'Phone: 3840 London Wall (4 lines). 'Grams: "Adnil, Ald, London."
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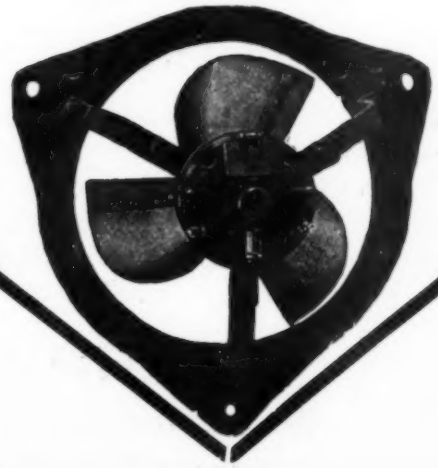

The fan with our patent "Beedle" blade, illustrated, affords up to 50% greater efficiency than the ordinary exhaust fan with a box blade.

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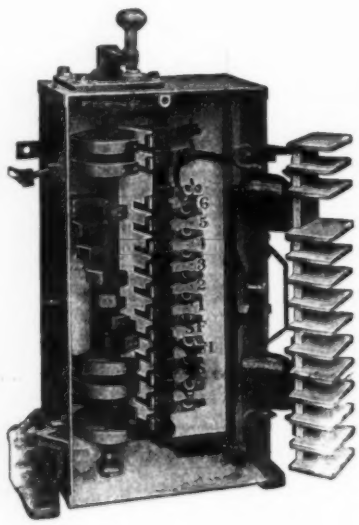

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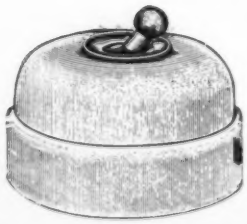

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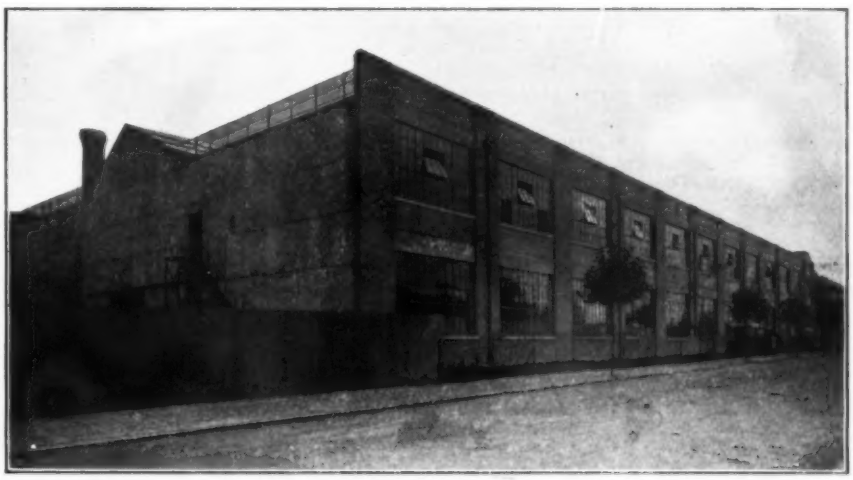

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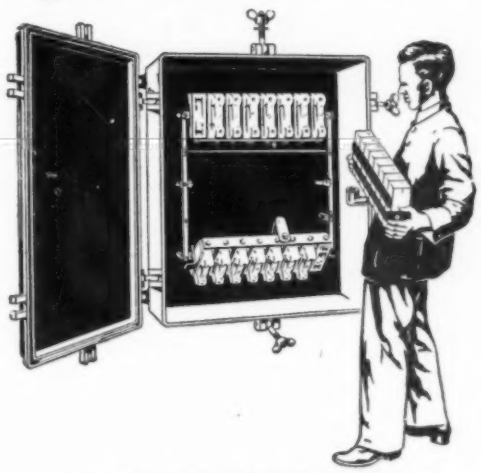

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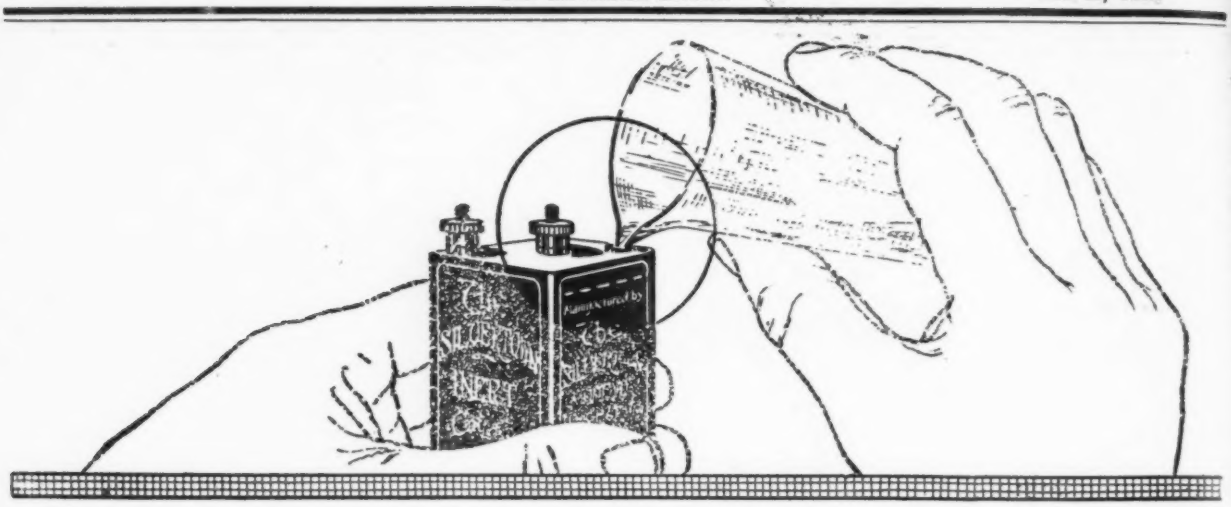

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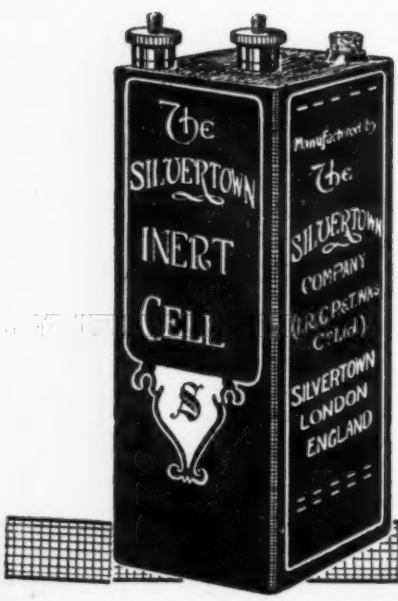

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Printed by THE PREMIER LINOTYPING AND PRINTING CO., LTD., 21-26, Dean Street, Fetter Lane, E.C. 4, and Published by THE ELECTRICAL REVIEW, LTD., 4, Ludgate Hill, London, E.C. 4.